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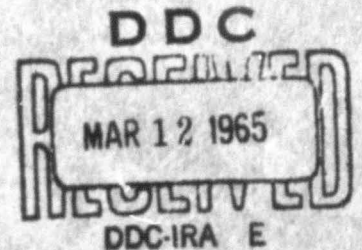
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LIPL: LINEAR INFORMATION
PROCESSING LANGUAGE

Robert Dupchak



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Robert Dupchak

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PREFACE AND SUMMARY

This Memorandum is a supplement to the Information Processing Language-V Manual,^{*} detailing a new alternate format in which IPL routines and data can be represented. Specifically, LIPL (Linear IPL) is a horizontal, linear, parenthesis format. This Memorandum also describes a new IPL Basic Process, J164, for in-process loading of LIPL routines and data. J164 has been coded as an IPL routine, and, therefore, can be used on any IPL computer. A description and listing of this routine is included; card or tape copies of the routine can be obtained by writing The RAND Corporation.

LIPL, like the parent IPL languages, was developed at The RAND Corporation and Carnegie Institute of Technology. Since it packs more information per card than the standard IPL representation and since it does not have a fixed-column format, it should be especially valuable in card-reader-limited systems and in remote teletype operations.

The use of LIPL is detailed in the Introduction, which is followed by a Reference section arranged for quick look-up of information by the LIPL user. Section III describes the IPL-coded, in-process LIPL loader, J164; the Appendix gives a complete listing of this routine. Section III and the Appendix are included solely for the use of the systems programmer responsible for incorporating LIPL into a particular object machine.

^{*} Allen Newell, F. M. Tonge, E. A. Feigenbaum, B. F. Green, and G. H. Mealy (eds.), Information Processing Language-V Manual, 2nd ed., Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1964.

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I. INTRODUCTION

Linear IPL, LIPL, is an alternate mode for representing Information Processing Language-V routines and data in a horizontal, linear, parentheses format. J164 is a new basic process for in-process loading of routines and data represented in LIPL.

Consider the example of a J165 load deck, shown in Fig. 1. The described list L1 can be represented in LIPL as follows:

L1=(9-1 S1 S2) 9-1=(0 A1 V1)

Parentheses are used to delimit lists; an equal sign indicates that the object to its right is named by the symbol to its left. Alternatively, the sublist can be inserted directly into the list:

L1=(9-1=(0 A1 V1) S1 S2)

In this case, we need not name the sublist:

L1=((0 A1 V1) S1 S2)

J164 will automatically give the unnamed sublist a local name.

The data list L2 can be represented in LIPL as follows:

L2=(0 9-0 9-1 9-2 9-3) 9-0=+17 9-1=-73.2
9-2=\$HOUSE\$ 9-3=/3077560

COMMENTS										T Y P E	N A M E	S I G N	P Q	S Y M B	L I N K
0000000011111111112222222222333333333333444444444455555555556666666666	11111111111111111111222222222222333333333333444444444455555555556666666666	22222222222222222222333333333333444444444455555555556666666666	33333333333333333333444444444455555555556666666666	4444444444444444444455555555556666666666	555555555555555555556666666666	66666666666666666666	77777777777777777777	88888888888888888888	99999999999999999999	5	L1		01	9-1 S1 S2	0
DATA HEADER DESCRIBED LIST											9-1			0	
DESCRIPTION LIST														A1 V1	0
DATA LIST											L2			0 9-0 9-1	
														9-2 9-3	0
DECIMAL INTEGER 17											9-0		01		17
FLOATING POINT -73.2											9-1		11732		2
ALPHANUMERIC 'HOUSE'											9-2		21HOUSE		
OCTAL INTEGER 3077560											9-3		31	30	77560
PRINT LIST											L3			0 9-1 9-2 9-3	0
											9-1		21THIS		
											9-2		21 IS L		
											9-3		21IPL		
ROUTINE HEADER										5	R1		00		
TEST IF SYMBOL (0) IS ON LIST (1)													J50		
													109-0 J100 J30		J5
											9-0		11W0 J2		J5
TEST IF SYMBOL (0) IS ON LIST (1)											R2		J50 J60		
											9-1		709-2 12H0 11W0		
													J2		
											9-2		709-1 J30		J8
TYPE FIVE START CARD--START AT R0										5	R0		R0		

Fig. 1— Example of a J165 load deck

A plus or a minus sign indicates that the number to its right is a numeric data term. If no decimal point occurs, it is loaded as an integer. If a decimal point does occur, it is loaded as a floating point number. The decimal point may also occur at the beginning or the end of the number (-.25 or +10.). Dollar signs are used to delimit alphanumeric data terms. A slash indicates an octal integer. Just as sublists may be placed directly inside their main lists, data terms may be placed directly inside the lists they are used on:

```
L2=(0 9-0=+17 9-1=-73.2 9-2=$HOUSE$ 9-3=/3077560)
```

The names of the data terms may now be dropped if desired:

```
L2=(0 +17 -73.2 $HOUSE$ /3077560)
```

The print list L3 can be represented in LIPL as follows:

```
L3=(0 $THIS$ $ IS L$ $IPL$)
```

If five or fewer columns separate the dollar signs, the characters are loaded left-justified and the data term is completed with blanks if necessary. This print list can also be represented in LIPL as follows:

```
L3=$THIS IS LIPL$
```

If more than five columns separate the dollar signs, J164 assembles a list of alphanumeric data terms. The head of

the list contains an internal zero and the data terms are given local names. Five characters are packed per data term, except that trailing blanks of one data term are repeated as leading blanks of the next data term. Trailing blanks are repeated since J157 suppresses them. Therefore, it is possible to enter a print list into a print line by simply generating its symbols using generator J100 with subprocess J157.

The routine R1 can be represented in LIPL as follows:

```
R1=(J50 109-0 J100 J30,J5) 9-0=(11WO J2,J5)
```

A P and a Q may precede any basic element. A comma indicates that the next symbol is a link. This routine may also be represented as follows:

```
R1=(J50 10(11WO J2,J5) J100 J30,J5)
```

The routine R2 can be represented in LIPL as follows:

```
R2=(J50,9-1 J60 709-2 12HO 11WO J2 709-1,9-2 J30,J8)
```

When a link occurs in the middle of a list, it is also used as the name of the next cell.

The complete LIPL load deck is shown in Fig. 2, exactly as it might be key punched. Symbols and numeric data terms must not contain internal blanks and they must be terminated on the right with either a right parenthesis, an equal sign, a comma, or a blank. Blanks may not follow a P or a Q. Except for the above restrictions, blanks may

Fig. 3—Example of a J164 deck and assembly listing

be used freely to improve the readability of the deck. J164 assumes that a blank occurs between every card. Therefore, a symbol or a numeric data term must not be split across two cards. Alphanumeric data terms may be split across two or more cards. Comments may be inserted at any point at which blanks are permitted by enclosing them in quotes. The domain of definition of local symbols is from one unparenthesized regional list name to the next unparenthesized regional list name.

Three pseudo commands are shown in Fig. 2--DT, RT, and GT. DT, a mnemonic for data, is equivalent to a Type-5 card with a Q of 1; it indicates that data is to be loaded. RT, for routines, is equivalent to a Type-5 card with Q = 0, and indicates that routines are to be loaded. Since routines and data must be loaded differently, J164 contains a switch that may be set to either routines or data. These two pseudos are used to flip this switch. Initially, when J164 is fired, this switch is set to data. Therefore, the DT on the first card in Fig. 2 need not have been punched. Data terms may be freely used in routines since J164 recognizes them independently of the routine/data switch. The pseudo GT, for go-to, is equivalent to a final Type-5 card. It indicates the end of a load deck, and the symbol to its right, R0 in the example, is taken as the name of the next routine to be interpreted. Alternately, the pseudo ND, for end, could have been used, in which case interpretation would continue with the instruction following J164. A complete list of pseudos is given in Sec. II. They may be used at any point in the load deck where blanks are permitted.

When J164 is fired, it will first list the load deck and give a sequence number to each card. It will then give an assembly listing that is cross-referenced with the load deck by means of the sequence numbers. An example of this listing is given in Fig. 3. The assembly listing may be suppressed by means of the pseudo NL, no listing.

Since all special characters are used in LIPL as punctuation, the special character regional symbols must be written in LIPL prefixed with an asterisk. Thus, the IPL symbols (5, \$18, and *30 are represented in LIPL as *(5, *\$18, and **30.

Several other types of symbols can be represented in LIPL--symbolic internal, absolute decimal internal, absolute octal internal, and mnemonic. These are described in Sec. II.

J164 will frequently be used to replace data structures and routines. Since the old structures and routines are no longer needed and would simply be using up available space, LIPL provides a mechanism for erasing them. Any symbol may be preceded by a period, in which case the symbol serves its normal contextual purpose and, in addition, the structure or routine named by the symbol (if any) is erased. A structure or a routine erase is used depending on the current setting of J164's routine/data switch.

Frequently, many data structures of the same form must be loaded. In LIPL, a copy of a structure may be represented by writing the name of the structure to be copied prefixed with two adjacent single quotes. An example of this feature is shown below:

L4=((0 S1 S2) (0 S1 S2)) L5=((0 S1 S2) (0 S1 S2))

L4=(9-0=(0 S1 S2) ''9-0) L5=''L4

Copies may be named or unnamed. An unnamed copy is given a local name if the structure copied had a local name; otherwise, the unnamed copy is given an internal name. Since J164 is a single-scan loader, only structures that are already in core or have been defined to the left can be copied.

II. REFERENCE

SYMBOLS

A decimal subscript is an unsigned decimal integer with no internal blanks.

An octal subscript is an unsigned octal integer with no internal blanks.

A regional symbol is

- 1) a letter, or
- 2) a letter immediately followed by a decimal subscript, or
- 3) a "*" immediately followed by any non-numeric character, or
- 4) a "*" immediately followed by any non-numeric character, immediately followed by a decimal subscript. (E.g., the IPL symbol "\$17" must be represented in LIPL as "\$*17".)

A local symbol is

- 1) a "9" immediately followed by a decimal subscript, or
- 2) a "9-" immediately followed by a decimal subscript.

J164 does not distinguish between the symbol "93" and "9-3". The domain of definition of local symbols is from one unparenthesized regional list name to the next unparenthesized regional list name.

A symbolic internal symbol is

- 1) an "8" immediately followed by a decimal subscript, or

- 2) an "8-" immediately followed by a decimal subscript.

A symbolic internal symbol is assigned an arbitrary equivalent from available space (1W34) when it first occurs, unless it is made synonymous (by naming) with another symbol. The internal symbol table may be reset at any time with the pseudo command RI. The internal symbol table may be printed with the pseudo command PI. J164 does not distinguish between the symbol "85" and "8-5".

An absolute internal symbol is

- 1) the digit zero, or
- 2) an "8." immediately followed by a decimal subscript, or
- 3) an "8/" immediately followed by an octal subscript.

The symbol stands for the absolute machine address specified by its subscript.

A mnemonic symbol is

- 1) two letters, or
- 2) two letters immediately followed by any number of letters and digits.

J164 looks only at the last five or fewer characters of a mnemonic symbol. Thus, although CAT, SECONDCELL, and THIRDCELL are all mnemonic symbols, J164 will not differentiate between the last two. A mnemonic symbol is assigned an arbitrary equivalent from available space (1W34) when it first occurs, unless it is made synonymous (by naming) with another symbol. The mnemonic symbol table may be reset at any time with the pseudo command RN. The mnemonic symbol table may be printed with the pseudo command PN.

An erase symbol is a "." immediately followed by a regional, internal, or mnemonic symbol. The symbol serves its normal contextual purpose and, in addition, the structure or routine named by the symbol (if any) is erased. The cell named by the symbol is cleared but not erased. A structure or routine erase is used depending on the current setting of J164's routine/data switch.

A copy symbol is a pair of single quotes immediately followed by a regional, local, internal, mnemonic, or erase symbol. The data structure named by this symbol is copied. The copied structure can be named by preceding the copy symbol with a name. An unnamed copy is given a local name if the structure copied had a local name; otherwise, the unnamed copy is given an internal name. Only structures that have been previously defined can be copied.

Symbols may not contain internal blanks. They must be terminated on the right with either a right parenthesis, an equal sign, a comma, or a blank. A symbol may not be split across two cards.

DATA TERMS

A sign is a "+" or a "-".

An integer data term is a sign immediately followed by a decimal integer.

A floating point data term is

- 1) a sign immediately followed by a decimal integer, immediately followed by a ".", or
- 2) a sign immediately followed by a decimal integer, immediately followed by a ".", immediately followed by a decimal integer, or

- 3) a sign immediately followed by a ".", immediately followed by a decimal integer.

An octal data term is a "/" immediately followed by an unsigned octal integer.

An alphanumeric data term is a "\$" followed by any number (including zero) of characters and blanks followed by another "\$". If five or fewer blanks and characters separate the dollar signs, a single left-justified data term is assembled. If six or more blanks and characters separate the dollar signs, then a list of alphanumeric data terms is assembled. The head of the list contains an internal zero and the data terms are given local names. Five characters are packed per data term except that trailing blanks of one data term are repeated as leading blanks of the next data term.

Numeric data terms must not contain internal blanks and must be terminated on the right with either a right parenthesis, a comma, or a blank. They may not be split over two cards. Alphanumeric data terms may be split over two or more cards.

LISTS

A name is a symbol followed by an equal sign, followed by the object being named. Lists, data terms, mnemonics, and copies may be named.

A basic element is

- 1) a symbol, or
- 2) a named mnemonic, or

- 3) a named copy, or
- 4) a data term, named or unnamed, or
- 5) a list, named or unnamed.

P and Q are octal digits.

An element is

- 1) a basic element, or
- 2) a Q immediately followed by a basic element, or
- 3) a P immediately followed by a Q, immediately followed by a basic element.

Blanks must not occur between P, Q, and the basic element.

A link is a comma followed by a symbol.

A list element is

- 1) an element, or
- 2) an element followed by a link.

A list is a "(" followed by one or more list elements, followed by a ")". Note that this definition is recursive.

LOAD DECKS

Blanks must not be embedded in symbols or numeric data terms. Blanks must not separate a P, Q, and a basic element. Except for these two restrictions, blanks may be used freely to improve the readability of the deck.

Pseudos are commands to the loader. They cause no code or data to be assembled. Pseudos may be inserted at any

point at which blanks are permitted. Pseudos must not contain internal blanks and they must be terminated on the right with a blank, a right parenthesis, or a comma. The complete set of LIPL pseudos is given below.

RT - routines

DT - data

Since the loader must handle data differently than routines, it must know which is being loaded. J164, therefore, has a routine/data switch which is set to data each time J164 is fired. This switch can be flipped with the RT and DT pseudos. The switch need not be flipped for data terms in routines, since the loader recognizes data terms independently of the switch. A Q preceding a basic element is effective both in routines and data. Thus, "29-1" is the local symbol "9-1" with Q = 2, regardless of the setting of the switch.

NL - no listing

This pseudo suppresses the assembly listing. The load deck is still listed, however.

RN - reset mnemonic table

RI - reset internal table

PN - print mnemonic table

PI - print internal table

ND - end

This pseudo causes loading to be terminated and interpretation to continue with the instruction following J164.

GT - go to

This pseudo causes loading to be terminated and interpretation to begin with the routine whose name occurs, after a blank, to the right of this pseudo.

Comments are delimited with quotes. They may be inserted at any point at which blanks are permitted.

A load deck consists of named lists, named data terms, comments, pseudos, named copies, erase symbols, and named mnemonics. It is punched on one or more cards using the full 80 columns of the card. The load deck is terminated with either the pseudo ND or GT.

LIPL LOADER J164

J164 loads one load deck from unit 1W18. It lists the deck and the assembly on unit 1W20. Loading into a specific block of main storage is accomplished by the use of the safe storage cell W34. W34 holds the name of the available space list used by the loading processes (initial loading, J140, J164, and J165) and initially holds H2. To load into a specific block, it is necessary to make the cells of the block into a list with J172 and put the name of this list into the safe storage cell W34. The first cell of the block is never loaded into, since, like H2, it is the head of the available space list. If the list 1W34 becomes exhausted, H2 is placed in W34 without push-down and loading continues from H2. Since J164 uses the print line 1W24, the print line is unsafe over J164 and it must be at least 80 columns long. J164 is an in-process loader; a conventional initial load deck is still required containing all the Type-2 and Type-3 cards defining regional symbols, blocks, print lines, etc. Routines and data cannot be loaded into auxiliary storage with J164, but data can be loaded into main storage and then moved (by J106 or J107) into auxiliary storage.

<u>J164 thru 9-11:</u>	Setup and clean up.....	17-19, 21-23
<u>9-100 thru 9-179:</u>	Executive routine.....	19, 32-33
<u>9-200 thru 9-233:</u>	Print lists.	
9-200	"MNEMONIC TABLE".	
9-210	"INTERNAL TABLE".	
9-220	"ERROR--NO MORE CARDS".	
<u>9-300 thru 9-332:</u>	Pseudo subroutines.	
9-311	ND--Stop.....	19
9-312	DT--Set routine/data switch plus.....	18
9-313	RT--Set routine/data switch minus.....	18
9-315	RN--Erase mnemonic table.	
9-316	RI--Erase internal table.	
9-317	PN--Set mnemonic print flag plus.....	18
9-318	PI--Set internal print flag plus.....	18
9-319	NL--Set listing desired flag minus.....	18
9-320	TR--Turn on full trace.	
9-324	GT--Set link to cell, stop.....	17, 19
<u>9-400 thru 9-419:</u>	Work cells, symbols, tables.	
9-400	Mnemonic table.....	25
9-401	Pseudo table.....	25
9-402	Local table.....	26
9-403	Internal table.....	26
9-404	Copy flag--J3 or J4.....	24
9-405	Erase flag--J3 or J4.....	24
9-406	Assembly print list.....	20-21
9-407	Last cell of assembly print list.....	21
9-408	Pure symbol for data term.....	20-21
9-409	Pure symbol for beginning of sublist.....	20-21
9-410	Pure symbol for end of sublist.....	20-21
9-411	Routine/data switch--Loading data?.....	17-18
9-412	Pure symbol for new card.....	20-21
9-413	Integer card count.....	20
9-414	Did LW34 = H2 at start?.....	18, 23
9-415	Link to this routine when done.....	17
9-416	Cell in print list before last copy.....	24
9-417	Is an assembly listing desired?.....	18
9-418	Is a mnemonic table desired?.....	18
9-419	Is an internal table desired?.....	18
<u>9-500 thru 9-799:</u>	Subroutines.	
9-500	Find current character.....	19
9-510	Find next character.....	19
9-520	Create a cell in H0 from LW34.....	18
9-530	Scan for next) , = or blank.....	23-24
9-540	Scan for next) , or blank.....	23-24
9-560	Put letter symbol or pseudo into (0).....	25-26
9-580	Put local or internal symbol into (0).....	26-28
9-600	Erase and/or copy (0), leave (0).....	24-25
9-620	Set octal data in (0), leave (0).....	28
9-630	Set decimal data in (0), leave (0).....	28-29
9-650	Set alphanu data in (0), leave (0).....	28, 29-30
9-680	Read and print a card.....	19
9-700	List and erase assembly print list.....	21
9-750	Skip comment or set copy flag.....	31
9-760	Add (0) to list LWO, set P and Q.....	31-32
9-770	Add an empty cell to list LWO.....	31
9-780	Erase the assembly print list.....	21
9-790	Print internal, mnemonic tables.....	23
<u>9-800 thru 9-981:</u>	Integer constants.	
9-8mn	Negative integer data term -mn.	
9-9mn	Positive integer data term +mn.	

W CELLS

W0	Current cell being assembled.....	31
W1	Is cell LWO empty?.....	31
W2	P or 9.....	31-32
W3	Q or 9.....	31-32
W4	Is program at top level?.....	32
W9	Current character.....	19

Fig. 4—Memory map and index

Routine	Sub-routines used	ne	Sub-routines used	Cells & tables read	Cells & tables modified	Routine	Sub-routines used	Cells & tables read	Cells & tables modified
J164	9-100 9-500 9-680 9-700 9-790		9-100 9-500 9-680 9-700 9-790		9-411 9-414 9-415 9-417 9-418 9-419 9-520 W0 W1 W2 W3 W4 W21 W22 W25 W30 W31 W34	9-560	9-520 9-530 9-600		9-400 9-401 1W25
						9-580	9-520 9-530 9-600		9-402 9-403 1W24 1W25
						9-600	9-520	9-411	9-404 9-405 9-406 9-407 9-416
						9-620	9-540		1W25 9-406 9-407
						9-630	9-540		9-406 9-407 1W25 W30
9-100	9-100 9-500 9-510 9-520 9-560 9-580 9-620 9-630 9-650 9-750 9-760 9-770	10	9-100 9-500 9-510 9-520 9-560 9-580 9-620 9-630 9-650 9-750 9-760 9-770	9-404 9-416 W9	9-402 9-405 9-406 9-407 W0 W1 W2 W3 W4	9-650	9-520 9-680		9-406 9-407 W25 W30
9-311		1				9-680			9-406 9-407 9-413
9-312		2			9-411	9-700	9-780	9-417	9-406 9-407 W21 1W24 1W25
9-313		3			9-411	9-750	9-510 9-680		9-404 W9 1W25
9-315		5			9-400	9-760	9-520	9-411	9-406 9-407 W0 W1 W2 W3
9-316		6			9-403	9-770	9-520		W0 W1
9-317		7			9-418				9-406 9-407 9-417
9-318		8			9-419				
9-319		9			9-417				
9-324	9-500 9-510 9-560 9-580	4	9-500 9-510 9-560 9-580		9-415				
9-500	9-680	0	9-680		W9 1W25				
9-510		0			W34				
9-520		0			W30				
9-530		0				9-790		9-400 9-403	9-418 9-419
9-540		0							

Fig. 5 — Usage map

III. LIPL LOADER, J164

The LIPL loader, J164, has been coded as an IPL routine, and, therefore, can be used on any IPL computer; a complete listing of the deck is given in the Appendix. The deck is sequenced in cols. 76-80 and includes extensive comments. J164 is the only regional symbol occurring in a NAME field. All other names are local symbols and they usually occur in ascending order.

The routine has been coded to operate as fast as possible. Therefore, it incorporates no error checking. The only error that will stop it is the presence of an end-of-file on the input unit before an ND or GT pseudo has been detected. On the average, the routine requires 225 interpretative cycles to load the equivalent of one standard IPL input card.

A memory map of J164 and index of Sec. III is given in Fig. 4; this map and index may be folded out for continual reference while reading this section. A usage map is given in Fig. 5.

The main task of the highest-level routine in J164 is to set up data for the executive routine 9-100. J164 begins by putting J0 into 9-415. J164 executes 9-415 just before it quits. The pseudo command GT causes the J0 in 9-415 to be replaced by the symbol appearing to the right of the GT command.

J164 then puts J4 into 9-411 and 9-417 and J3 into 9-418 and 9-419. These cells always contain either J3 or J4. 9-411 is the routine/data switch. It contains J3 if routines are being loaded and J4 if data are being loaded.

The pseudo commands RT and DT change the contents of this cell. 9-417 indicates if an assembly listing is desired. The pseudo command NL places a J3 into this cell. 9-418 indicates whether the mnemonic table is to be printed. The pseudo command PN places a J4 into this cell. 9-419 indicates whether the internal table is to be printed. The pseudo command PI places a J4 into this cell.

J164 then preserves W21, W22, W25, W30, and W31. It puts an integer data term equal to 1 into the print column, print spacing, and entry column cells, and also puts a zero into W31 to suppress tracing.

J164 next sets routine 9-520 identical to 9-521. Whenever a cell is needed from 1W34, it is obtained by firing 9-520. 9-521 is a subroutine that removes the first list cell from list 1W34, clears the cell, and leaves its name in H0. However, if list 1W34 becomes exhausted, it stores the symbol H2 into W34 and sets 9-520 identical to J90 so that from then on the user's program is assembled into cells taken from H2.

Next, J164 tests if 1W34 = H2 and it stores the result of this test, 1H5, into 9-414. If the test comes out plus, J164 cuts off the last one-third of the available space list H2 and puts the name of this last third into W34. Since the tail end of H2 is usually in sequential order and since J164 loads sequentially into the cells of list 1W34, the assembly listing will usually come out in sequential order. If this were not done, the cell names in the assembly listing would occur in a random order and it would be difficult to locate a particular cell in a large listing.

J164 then clears the print line (setting the column pointer 1W25 to 1), preserves W9, executes 9-680, and then executes 9-500. 9-680 reads a line from the input unit by executing J180 and prints it by executing J155. It also does a few other tasks that will be discussed later. 9-500 checks if the character in the print line at column 1W25 is non-blank. If it is non-blank, this character, which is read by using J186, is placed into W9 (W9 always contains the so-called current character), and H5 is set plus. Otherwise, H5 is set minus and the routine advances 1W25 to the next non-blank column and puts the character at that column into W9. If the rest of the print line is blank, it reads and prints a card by executing 9-680 and tries again until it finds a non-blank column. Thus, the routine is used to find the current character. 9-510, which finds the next character, is identical to 9-500 except that it first advances 1W25 by one column.

J164 next preserves and sets up W0-W4 and fires the executive routine 9-100. 9-100 does all the actual assembling. It is executed recursively each time a left parenthesis is encountered. It is terminated when a right parenthesis, the pseudo ND, or the pseudo GT is encountered. 9-100 operates exactly the same when it is recursively assembling a sublist as when it is operating at the top level (except only in the latter case is the local symbol table reset when a regional list name is encountered). Therefore, it also assembles a list of all the unparenthesized symbols. In the example shown in Fig. 3, 9-100 would also have assembled the following list:

500	L1	506
506	L2	515
515	L3	522
522	R1	528
528	R2	0

This useless list is erased by routine 9-700, as we shall see.

Each time a cell is assembled, its name is added to the end of the assembly print list, or simply the print list, 9-406. This list is used by routine 9-700 to generate the assembly listing if requested. When a data term is assembled, the pure symbol (pure in the sense that the cell named by the symbol is never used for anything) 9-408 is put on the print list just before the name of the data term. This is necessary since the listing routine must interpret a data term differently than a list cell. When a new sublist is begun, the executive routine puts the pure symbol 9-409 on the print list just before the first cell of the sublist. When a sublist is terminated, the executive routine puts the pure symbol 9-410 on the print list just after the last cell of the sublist.

9-680 reads a card by executing J180. If there is no card present, it prints ERROR--NO MORE CARDS and does a J7. If there is a card, it adds one to the integer data term 9-413, the card count, and enters this number together with the word CARD into the print list. It then prints the line, blanks out the word CARD together with the number and adds the pure symbol 9-412 to the print list followed by a locally named copy of the integer card count 9-413.

Cell 9-407 always contains the name of the last cell on the print list. This means that each time we want to add something to the end of the print list, we don't have to go down the entire list. However, now we have the responsibility of keeping this cell updated.

Thus, the print list contains the names of the cells assembled, the pure symbols 9-408, 9-409, 9-410, and 9-412, and copies of the integer card count 9-413. Fig. 6 shows the complete print list generated by the load deck of Fig. 3.

We will discuss the executive routine 9-100 in greater detail later. Assume that it has now terminated and returned control to J164's setup routine. J164 then restores W0-W4 and executes 9-700. 9-700 checks cell 9-417 to see if an assembly listing is desired. If not, it links to 9-780, a subroutine that erases the print list, the useless list of unparenthesized symbols, and the card count data terms. If an assembly listing is desired, 9-700 generates and prints the assembled cells and at the same time erases the useless list of unparenthesized symbols and the card count data terms. Then, just before terminating, it erases the print list. The routine divides the page into four vertical strips, each 28 columns wide. A list is printed down a strip. The highest-level lists are printed down the left strip. Their sublists are interpolated and printed in the strip to the right of the superlist. All lists of depth 3 or greater are printed in the third strip from the left. Lists at the highest level and lists of depth 3 or greater are separated by printing one blank line before and after. Data terms at the highest level are printed in the left strip. If a data term is named in a list, it is printed on the same line as the cell that names

9-406	0			518	
	500			9-409	
	9-412			519	
	9- α			520	
	9-409			9-409	
	L1			521	
	9-409			9-410	
	501			522	
	502			9-409	
	503			R1	
	9-410			523	
	504			9-409	
	505			524	
	9-410			525	
	506			9-410	
	9-409			526	
	L2			527	
	507			9-410	
	9-408			9-412	
	508			9- ω	
	509			528	
	9-408			9-409	
	510			R2	
	511			529	
	9-408			530	
	512			9-412	
	513			9- θ	
	9-408			532	
	514			533	
	9-410			534	
	9-412			535	
	9- β			531	
	515			9-410	0
	9-409	9- α	+01		1
	L3	9- β	+01		2
	516	9- ω	+01		3
	9-409	9- θ	+01		4
	517				

Fig. 6— Assembly print list generated by load deck of Fig. 3

it. The name of a cell goes in col. 1, P in col. 8, Q in col. 10, the symbol in col. 12, and the link in col. 18--all modulo 28. Card numbers are printed as CARD n beginning at col. 111. They are printed on the same line as the first cell assembled by that card. If a card causes nothing to be assembled (as, for example, a card with nothing but comments), its card number is not printed. This routine is completely self-contained, except for subroutine 9-780.

After executing the listing routine 9-700, J164 next executes routine 9-790 which prints the mnemonic table if 9-418 contains J4, and prints the internal table if 9-419 contains J4. The internal format of these tables will be described later.

J164 then checks cell 9-414, which indicates if cell W34 contained H2 at the start. If W34 did contain H2 at the start and if it doesn't now, the list 1W34 (which originally was the last third of H2) is tacked onto the end of the available space list H2 (in effect, it is erased) and the symbol H2 is stored into W34. Finally, J164 restores W21, W22, W25, W30, and W31, and then terminates by linking to the routine named in cell 9-415.

We will now look at the subroutines used by the executive routine 9-100. There are two scan routines, 9-530 and 9-540. These routines have no inputs or outputs in H0. The only cell they modify (other than H5, which is unsafe over all subroutines) is W30, the field length cell. 9-530 puts an integer data term into W30 that is equal to the difference between column 1W25 and the first column to the right of 1W25 that contains either a right parenthesis, a

comma, an equal sign, or a blank. If 1W25 points to the first character of a LIPL symbol and 9-530 is executed, upon completion 1W30 will contain the width of that symbol since all LIPL symbols must terminate with one of these four characters. 9-540 is identical to 9-530 except that it does not scan for equal signs. 9-540 is used in reading numeric data terms since LIPL numeric data terms must always terminate with either a right parenthesis, a comma, or a blank.

9-404 and 9-405 are the copy flag and the erase flag. Normally these cells contain J3. However, whenever the executive routine 9-100 encounters a pair of adjacent quotes, it causes a J4 to be placed into 9-404; when it encounters a period, it causes a J4 to be placed into 9-405. The routines that read LIPL symbols from the print line (9-560 and 9-580) leave the symbol in H0 and link to routine 9-600. If the copy flag is on (contains J4), input (0) is copied. The method of copying is the same as that used by J74 except that the cells for the copy are taken from list 1W34 and the names of the cells are added to the print list 9-406. (Before the copy process is started, the name of the last cell on the assembly print list is stored into cell 9-416. This is used by the executive routine 9-100 to slightly fudge the print list.) If the erase flag is on, the structure or routine named by the original input (0) is erased. If the routine/data switch 9-411 is minus, indicating that routines are being loaded, the input (0) is erased as a routine; otherwise, the input is erased as a data structure, except that the head cell is simply cleared instead of being erased. In any case, upon exit both flags

are turned off, H5 is set plus, and (0) contains input (0) or, if the copy flag was on, the name of the copy.

The mnemonic table 9-400 and the pseudo table 9-401 have identical form. They have the form of description lists, except that the attributes are the names of alphanumeric data terms. This may be seen by looking at the pseudo table 9-401 in the program listing given in the Appendix, where the attributes are not the symbols occurring on the list but rather the data terms named by those symbols. Therefore, unfortunately, the IPL description list processes cannot be used on these "description lists."

Routine 9-560 is used to read regional and mnemonic LIPL symbols and pseudos from the print line. 1W25 is assumed upon entry to point to the first character of the symbol (except in the case of a special character regional symbol which LIPL requires to be prefixed with an asterisk, in which case 9-560 assumes 1W25 upon entry to point to the column after the asterisk). The routine first executes 9-530 which sets 1W30 to the width of the symbol. It then checks to see if the symbol is a regional symbol. It is a regional symbol if the character in col. 1W25+1 is a digit or if the width of the symbol is 1. If it is a regional symbol, it executes J181 which puts the symbol into H0 and it then links to 9-600 which copies and/or erases if required and sets H5 plus. If it is not regional, it reads the symbol into H0 as an alphanumeric data term by using J182. It then searches the pseudo table 9-401. If it is a pseudo, it puts the name of the equivalent pseudo subroutine into H0 and quits with H5 minus. If it is not a pseudo, it must be a mnemonic, so it searches the

mnemonic table; if found, it puts the equivalent symbol into H0 and links to 9-600. If it is not found in the mnemonic table, it creates an internal symbol, by using 9-520, makes this new symbol equivalent to the mnemonic symbol in the mnemonic table, leaves the new symbol in H0, and links to 9-600. Thus, upon completion H5 is minus and (0) contains the name of a pseudo subroutine, or H5 is plus and (0) contains either a regional symbol, a symbol equivalent to a mnemonic symbol, or the name of a copy if the copy flag was on. In any case, 1W25 now points to the first column after the LIPL symbol or pseudo.

The local symbol table 9-402 and the internal symbol table 9-403 are in the form of empty described lists. The attributes of their description lists are LIPL subscripts represented as absolute internal symbols, and their values are symbols obtained from 1W34 by means of routine 9-520. For example, if the LIPL local symbols 9-1 and 935 were assigned the equivalent IPL local symbols 1347 and 1409, the local symbol table might look like this:

9-402	02	1700	0
1700	04	0	
	04	1	
	02	1347	
	04	35	
	02	1409	0

Routine 9-580 is used to read local and internal LIPL symbols from the print line. It has one input in H0. If (0) is J3, the routine assumes that the character at col. 1W25 is the 8 at the beginning of an internal LIPL symbol; if (0) is a J4, it assumes that the character

at col. 1W25 is the 9 at the beginning of a local LIPL symbol. The routine saves input (0), advances 1W25 by one column, and branches on this next character. This character is either a minus sign, a period, a slash, or a digit. If the character is a period, indicating an absolute decimal symbol, it advances 1W25 by 1, executes 9-530 to set 1W30 to the width of the subscript, executes J181 to put the subscript, as an absolute internal symbol, into H0, makes this symbol local if the original input (0) was J4, and then links to 9-600 to copy and/or erase the symbol if required. If the character being branched on is a slash, indicating an absolute octal symbol, it advances 1W25 by 1, executes 9-530 to set 1W30 to the width of the subscript, executes J182 to put the subscript into H0 as an octal data term, executes J128 to convert this octal data term to a (decimal) integer data term, decrements 1W25 by 1, executes J159 to enter this integer into the print line right-justified, and then goes to the same point in the routine to which the character period branched. If the character being branched on is a minus sign or if it is a digit, both indicating local symbols, the routine does the same thing, except that in the case of the minus sign 1W25 is first advanced by one column. The routine then executes 9-530 to set 1W30 to the width of the subscript. It then puts the subscript as an absolute internal symbol into H0 by executing J181. It then uses J10 to find the equivalent symbol for this subscript on the local symbol table 9-402 (if input (0) was J4) or on the internal table 9-403 (if input (0) was J3). If found, this equivalent symbol is left in H0 and the routine links to 9-600; if not found, a new symbol is created by executing 9-520. This symbol

is made local or internal, depending on input (0), and it is assigned as the value of the subscript on the internal or local table. This new symbol is left in H0 and the routine links to 9-600. Thus, upon completion H5 is plus, (0) contains either an absolute symbol, the equivalent of a LIPL local or symbolic internal symbol, or the name of a copy, and 1W25 points to the first column after the LIPL symbol.

Three routines are used to assemble data terms: 9-620 assembles octal data terms; 9-630 assembles numeric data terms, both integers and floating point; and 9-650 assembles alphanumeric data terms and alphanumeric print lists. They all have one input (0), which they leave as output (0). They all assemble the LIPL data term beginning at col. 1W25 into cell (0), except 9-650 when it assembles a print list, in which case (0) becomes the name of the list. They assume that the character at col. 1W25 is a slash, a plus sign or a minus sign, or a dollar sign, respectively. When they assemble a data term, they add the pure symbol 9-408 and the name of the assembled cell to the assembly print list 9-406. In addition, when 9-650 assembles a print list, it adds the names of the cells of the print list to 9-406. They all terminate with 1W25 pointing to the next column after the LIPL data term.

9-620 first advances 1W25 by 1. It then executes 9-540 to set 1W30 to the width of the octal data term. Next, it executes J182 to put the octal data into cell (0), then it adds the pure symbol 9-408 and (0) to list 9-406 and quits.

9-630 begins by adding the pure symbol 9-408 and (0) to list 9-406. It then counts the number of columns to the next period, advances 1W25 by 1, and sets 1W30 to the width of the data term by executing 9-540. If the next period is beyond the end of the data term, it executes J182 to input the LIPL integer into cell (0), and quits. (This routine only forms the absolute value of a data term; the executive makes it negative if required.) If the next period occurs before the end of the data term, it forms two data terms, one for the integral part of the LIPL data term and the other for the fractional part of the data term, and places their sum into (0) and terminates. It forms the integral part by doing J182 with 1W30 set equal to the number of columns to the next period. It forms the fractional part by doing a J182 with 1W30 set equal to the number of columns between the period and the end of the data term and dividing this number repeatedly by 10, once for each column between the period and the end of the data term.

Routine 9-650, which assembles alphanumeric data, begins by making input (0) a blank alphanumeric data term. If a dollar sign occurs in col. 1W25+1, it advances 1W25 by 2, puts the pure symbol for a data term 9-408 and input (0) on the print list 9-406, and terminates. If a dollar sign occurs in the next six columns, but not in the very next column, the routine advances 1W25 by 1, sets the field width 1W30 to one less than the distance to the next dollar sign, inputs the alphanumeric data into cell (0) by executing J182, again advances 1W25 by 1 (just past the second dollar sign), puts the pure symbol for a data term 9-408

and input (0) on the assembly print list 9-406, and terminates. If the next dollar sign occurs further than six columns away, the routine advances 1W25 by 1, makes input (0) identical to an empty list, puts the pure symbol for the beginning of a sublist 9-409 and the input (0) on the assembly print list 9-406, and then begins a cycle. The cycle begins by checking if 1W25 is greater than 80. If greater than 80, 9-680 is executed to read and print a card and 1W25 is reset to 1. The cycle continues in any case by checking to see if col. 1W25 contains a dollar sign, in which case 1W25 is advanced by 1, the pure symbol for the end of a sublist, 9-410, is added to the assembly print list 9-406, and the routine terminates. Otherwise, the cycle continues by checking to see if the next four columns contain a dollar sign. If not, it creates two cells from list 1W34 by executing 9-520 twice. It puts the name of the second cell into the first cell and it adds the first cell to the end of list (0). It adds the name of the first cell, the pure symbol for a data term, 9-408, and the name of the second cell to the assembly print list 9-406. It then reads the alphanumeric data beginning at col. 1W25 with a field width 1W30 equal to 5 into the second cell by executing J182. Then 1W25 is decremented by the number of trailing blanks in the last data term assembled, and the routine recycles. If, at the start of the cycle, one of the next four columns contains a dollar sign, the same process occurs, except that the field width 1W30 is set to one less than the distance to the next dollar sign and instead of recycling, 1W25 is advanced by 1, the pure symbol for the end of a sublist, 9-410, is added to the assembly print list 9-406, and the routine is terminated.

Routine 9-750 is used to skip over comments or to set the copy flag 9-404. Each time the executive routine 9-100 encounters a quote, it executes 9-750. Column 1W25 always contains a quote when 9-750 is executed. The routine advances 1W25 by 1. If this next column contains another quote, the routine stores J4 into the copy flag 9-404 and links to 9-510. Otherwise, it advances 1W25 one column past the next quote and terminates. If there isn't another quote in this print line, the routine reads and prints a card by executing 9-680. It repeats this process until it finds the second quote and then it sets 1W25 one column beyond and terminates.

W0 always contains the name of the current cell being assembled. W1 contains J3 or J4. If cell 1W0 has not yet been assembled, it is considered empty and W1 contains J4. If the current cell 1W0 has been assembled, W1 contains J3. Lists are always assembled from the head cell down. Cell 1W0 is, therefore, the last cell of the list being currently assembled. And, according to standard IPL terminology, it is also a list in its own right--an empty list. Routine 9-770 adds an empty cell to list 1W0 (or cell 1W0, depending on how you want to view it) if W1 is minus. It does this by executing 9-520 which creates a new cell from 1W34, making the name of this cell the link of cell 1W0, putting the name of this new cell into W0, and setting W1 plus.

W2 and W3 normally contain the absolute internal symbol 9. Whenever the executive routine 9-100 encounters a P, it is stored in W2 as an absolute internal symbol. Whenever a Q is encountered, it is stored into W3 as an absolute internal symbol. Routine 9-760 adds the symbol (0) to list

1W0. If cell 1W0 is not empty ($1W1 \neq J4$), the routine adds an empty cell to 1W0 by doing the equivalent of 9-770. In any case, input symbol (0) is stored into cell 1W0 and 1W0 is added to the assembly print list 9-406. If 1W3 (Q) is not (the absolute internal symbol) 9, the Q of cell 1W0 is set to 1W3 by executing J195 and W3 is reset to 9. If 1W3 originally was 9 and if the routine/data switch 9-411 contains J3, indicating that routines are being loaded, the Q of cell 1W0 is set to 0. If 1W2 (P) is not (the absolute internal symbol) 9, the P of cell 1W0 is set to 1W2 by executing J194 and W2 is reset to 9. Finally, J3 is stored into W1, indicating that cell 1W0 has been assembled and is not empty.

W4 contains J4 if the executive routine 9-100 is operating at its top level; otherwise, it contains a J3. Its only function is to help in determining when to reset the local symbol table.

We have now described all the routines, tables, working cells, and symbols used by J164, except the executive routine 9-100. A detailed flowchart of the routine is given in Fig. 8. The executive routine, as the name implies, does little more than sequence subroutine calls. Most of this sequencing is accomplished by branching on the current character, which is always contained in W9. Branches on the current character are represented in the flowchart as hexagons. If the current character 1W9 is the character in a hexagon, program control moves along the horizontal arrow. Otherwise, it moves along the down arrow. This branching is usually accomplished by means of description lists. The characters in the hexagons appear

as attributes (in the form of regional symbols) on the description list and they have for values the name of the section of 9-100 to which control is to pass for this character. Thus, to branch on the current character, the program finds the value of attribute 1W9 on a description list and then it links to J1.

When 9-100 is fired for the very first time, the set-up routine has already read the first card into the print line, preserved W0-W4 and W9, and placed an empty cell into W0, J4 into W1 and W4, the absolute internal symbol 9 into W2 and W3, and the first character into W9.

Suppose we did not have to worry about copy symbols, erase symbols, pseudos, the symbol 0, named mnemonics, Ps and Qs, or the order in which things are placed on the assembly print list. Then, a simplified flowchart for 9-100 would look like Fig. 7. From the simplified flowchart to the complete flowchart is just a matter of adding details.

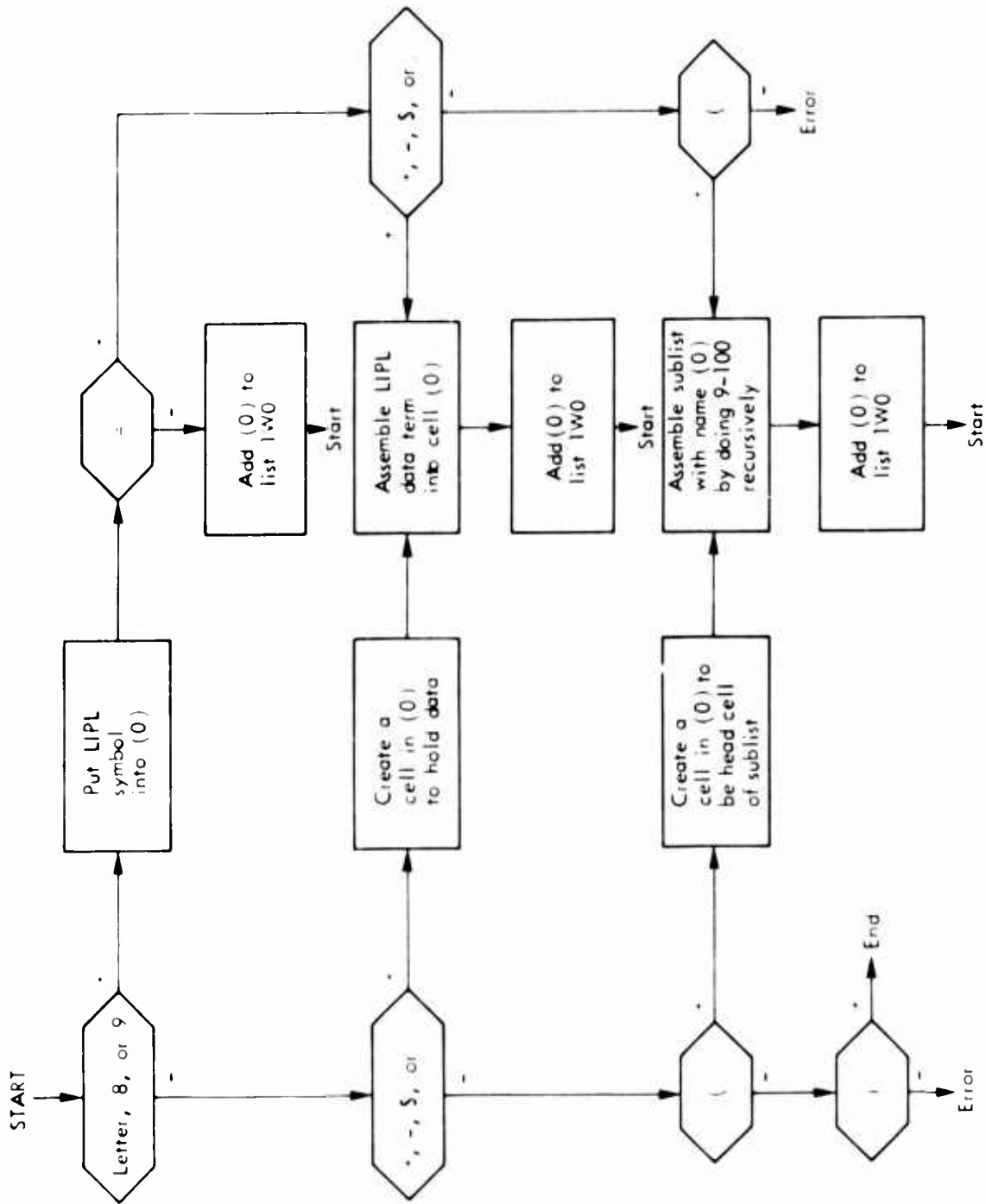
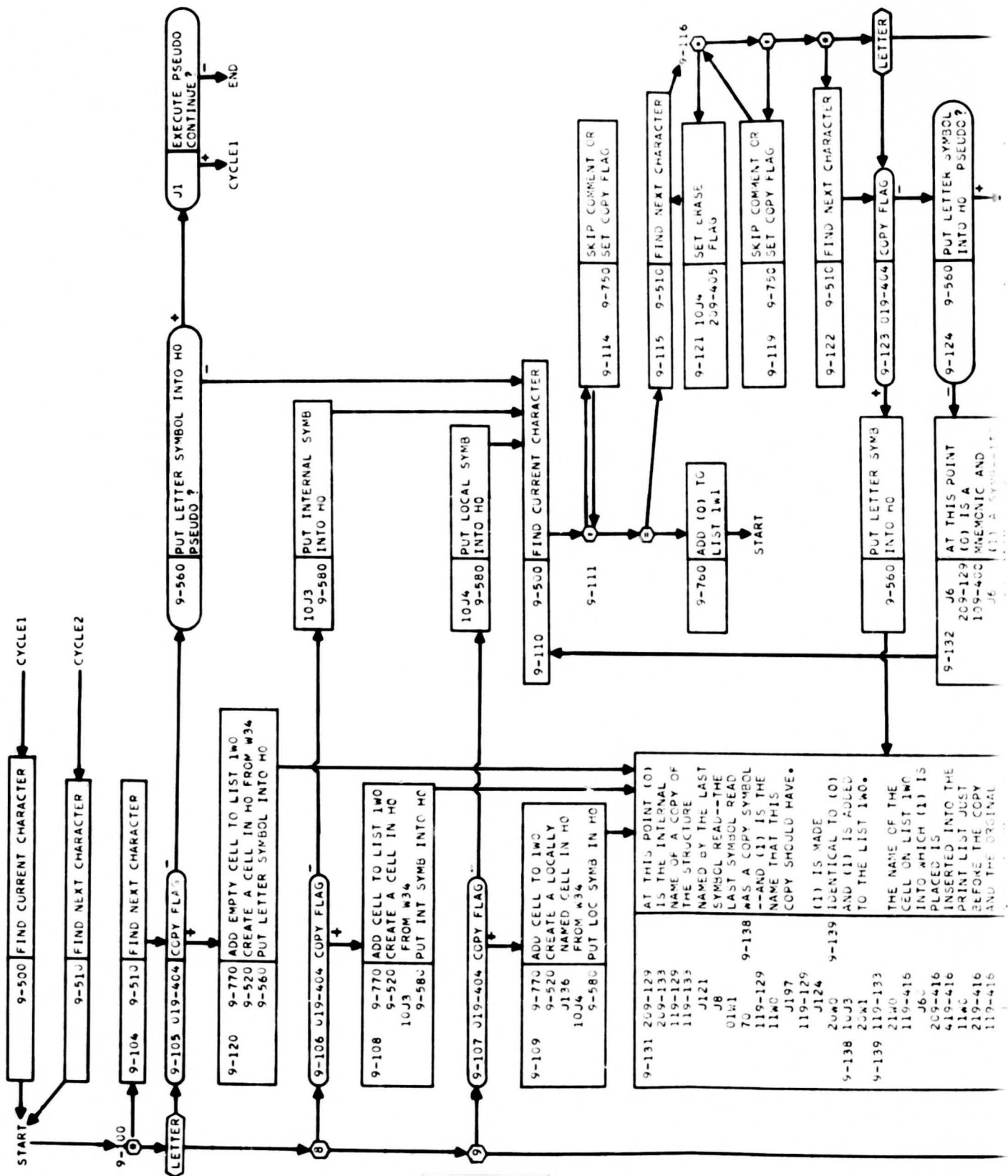
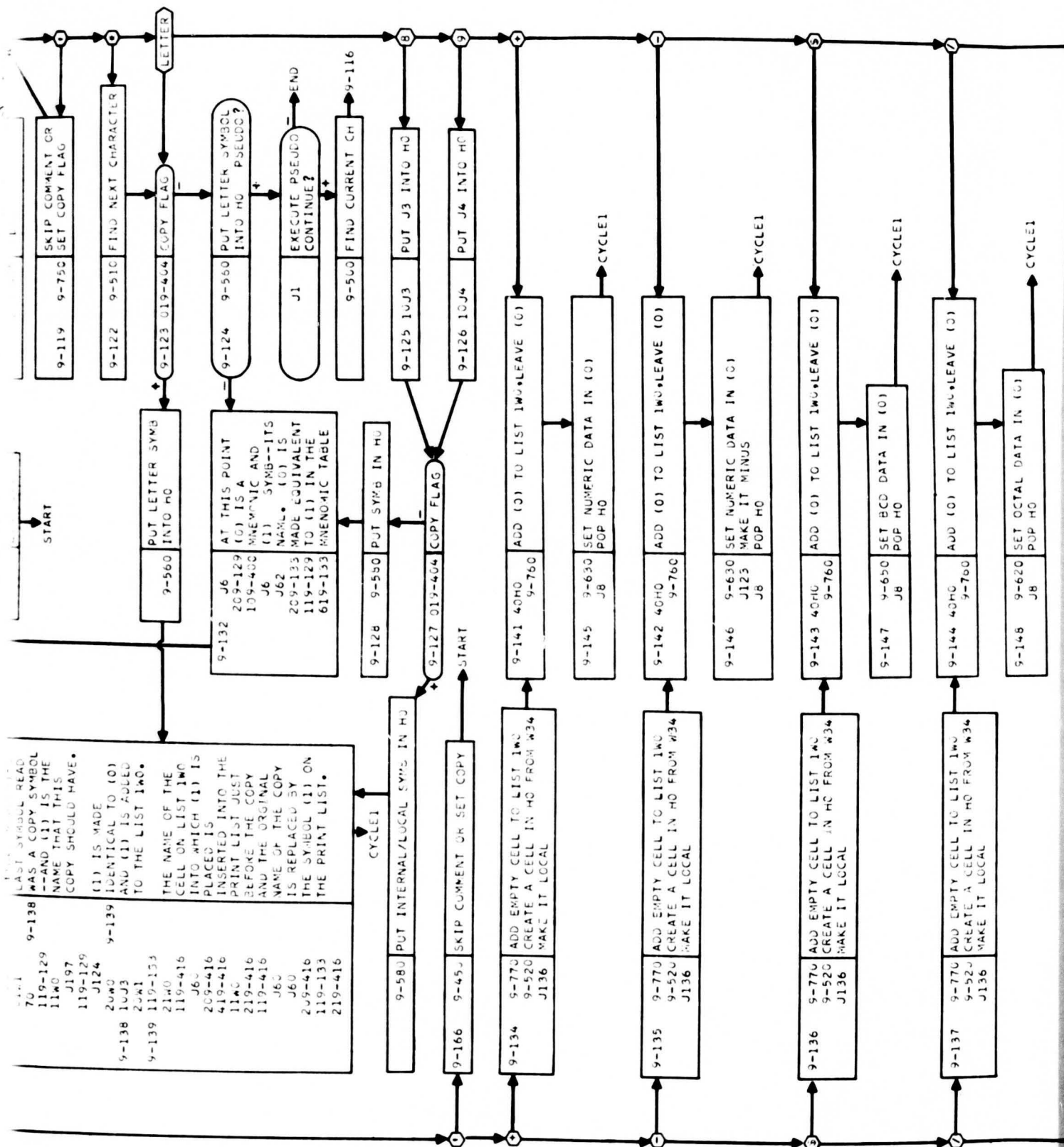


Fig. 7—Simplified flowchart of executive 9-100





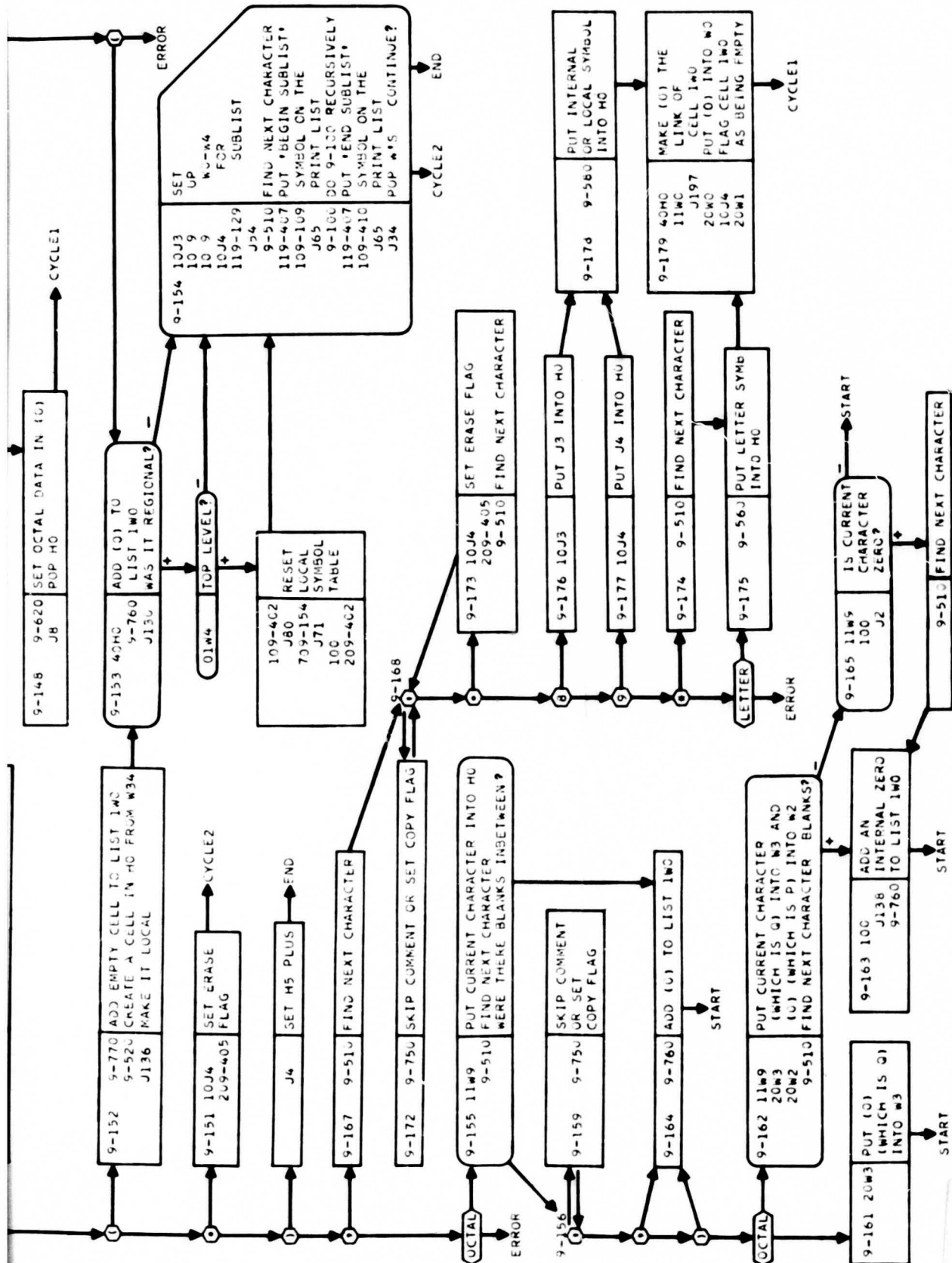


Fig. 8—Flowchart of executive 9-100

Appendix

J164 LISTING

100 SET UP, CLEAN UP*****	5	04	LIPL	0010
PUT J0 IN 9-145, J4 IN	*	10J0	LIPL SET UP	0020
9-417 AND 9-411, J3 IN	*	209-415	LIPL SET UP	0030
9-418 AND 9-419.	*	10J4	LIPL SET UP	0040
PRESERVE W21, W22, W25,	*	609-417	LIPL SET UP	0050
W30, AND W31.	*	209-411	LIPL SET UP	0060
IF 1W34=H2, PUT THE LAST	*	10J3	LIPL SET UP	0070
THIRD OF LIST H2 IN W34.	*	609-418	LIPL SET UP	0080
READ A CARD, SET UP	*	209-419	LIPL SET UP	0090
WC-W4 AND W9, AND DO	*	40W31	LIPL SET UP	0100
9-100. THEN DO 9-700	*	109-900	LIPL SET UP	0110
AND 9-790. IF 1W34=H2	*	20W31	LIPL SET UP	0120
AT START AND IT DOESN'T	*	43W21	LIPL SET UP	0130
NOW, TIE LIST 1W34 ON	*	109-10	LIPL SET UP	0140
TO END OF H2 AND PUT H2	*	20W21	LIPL SET UP	0150
INTC W34. RESTORE ALL	*	40W22	LIPL SET UP	0160
W'S. LINK TO ROUTINE IN	*	109-901	LIPL SET UP	0170
9-145.	*	20W22	LIPL SET UP	0180
	*	40W25	LIPL SET UP	0190
	*	109-11	LIPL SET UP	0200
	*	20W25	LIPL SET UP	0210
*****	*	40W30	LIPL SET UP	0220
* MEMORY MAP	* *	109-521	LIPL SET UP	0230
-----	* *	109-520	LIPL SET UP	0240
* W CELLS	* *	J121	LIPL SET UP	0250
WC CURRENT CELL BEING ASSEMBLED	* *	51W34	LIPL SET UP	0260
W1 IS 1W0 EMPTY Y/N	* *	10H2	LIPL SET UP	0270
W2 P	* *	J2	LIPL SET UP	0280
W3 Q	* *	11H5	LIPL SET UP	0290
W4 IS PROGRAM AT TOP LEVEL Y/N	* *	209-414	LIPL SET UP	0300
W9 CURRENT CHARACTER	* *	709-1	LIPL SET UP	0310
* 0-99 SET UP, CLEAN UP	* *	10H2	LIPL SET UP	0320
* 100-199 EXECUTIVE	* *	J126	LIPL SET UP	0330
* 200-299 PRINT LISTS	* *	40H0	LIPL SET UP	0340
200 'NEUMONIC TABLE'	* *	109-902	LIPL SET UP	0350
210 'INTERNAL TABLE'	* *	J6	LIPL SET UP	0360
220 'ERROR--NO MORE CARDS'	* *	J112	LIPL SET UP	0370
* 400-499 WORK CELLS, SYMBOLS	* *	109-903	LIPL SET UP	0380
400 NEUMONIC TABLE	* *	J6	LIPL SET UP	0390
401 PSEUDO TABLE	* *	40H0	LIPL SET UP	0400
402 LOCAL TABLE	* *	J113	LIPL SET UP	0410
403 INTERNAL TABLE	* *	40H0	LIPL SET UP	0420
404 COPY FLAG	* *	10H2	LIPL SET UP	0430
405 ERASE FLAG	* *	J6	LIPL SET UP	0440
406 PRINT LIST	* *	J200	LIPL SET UP	0450
407 LAST CELL OF PRINT LIST	* *	J6	LIPL SET UP	0460
408 SYMBOL 4 DATA TERM	* *	J9	LIPL SET UP	0470
409 SYMBOL 4 BEGINNING OF SUBLIST	* *	J75	LIPL SET UP	0480
410 SYMBOL 4 END OF SUBLIST	* *	20W34	LIPL SET UP	0490
411 DATA MODE FLAG	* *	J154	LIPL SET UP	0500
412 SYMBOL FOR NEW CARD	* *	40W9	LIPL SET UP	0510
413 INTEGER CARD COUNT	* *	9-680	LIPL SET UP	0520
414 W32=H2 AT START Y/N	* *	9-500	LIPL SET UP	0530
415 LINK TO THIS ROUTINE	* *	10J4	LIPL SET UP	0540
* BEFORE LAST COPY WAS MADE	* *	10 9	LIPL SET UP	0550
417 LISTING DESIRED Y/N	* *	10 9	LIPL SET UP	0560
418 NEUMONIC TABLE DESIRED Y/N	* *	10J4	LIPL SET UP	0570
419 INTERNAL TABLE DESIRED Y/N	* *	J90	LIPL SET UP	0580
		J54	LIPL SET UP	0590

* 500-799 SUBROUTINES	* *	9-100	LIPL SET UP	0600
500 FIND CURRENT CHARACTER	* *	J34	LIPL SET UP	0610
510 FIND NEXT CHARACTER	* *	30W9	LIPL SET UP	0620
520 CREAT A CELL IN HO	* *	J154	LIPL SET UP	0630
530 SCAN FOR NEXT) , = OR BLANK	* *	J155	LIPL SET UP	0640
540 SCAN FOR NEXT) , OR BLANK	* *	9-700	LIPL SET UP	0650
560 PUT SYMBOL IN HO--LETTER	* *	J154	LIPL SET UP	0660
580 PUT SYMBOL IN HO--8-,9+	* *	J155	LIPL SET UP	0670
600 ERASE, COPY IF REQUIRED	* *	9-790	LIPL SET UP	0680
620 SET OCTAL DATA IN (0)	* *	J154	LIPL SET UP	0690
630 SET NUMERIC DATA IN (0)	* *	J155	LIPL SET UP	0700
650 SET BCD DATA IN (0)	* *	019-414	LIPL SET UP	0710
680 READ, PRINT A CARD	* *	709-2	LIPL SET UP	0720
700 PRINT, ERASE PRINT LIST	* *	11W34	LIPL SET UP	0730
750 SKIP COMMENT OR SET COPY FLG	* *	10H2	LIPL SET UP	0740
760 AD 2 LIST 1W0, SET P, Q	* *	J2	LIPL SET UP	0750
770 AD AN EMPTY CELL 2 LIST 1W0	* *	70	9-2 LIPL SET UP	0760
780 ERASE PRINT LIST	* *	11W34	LIPL SET UP	0770
790 PRINT INTERNAL, NEUMONIC TBL	* *	10H2	LIPL SET UP	0780
* 800-899 NEGATIVE INTEGERS	* *	J61	LIPL SET UP	0790
* 900-999 POSITIVE INTEGERS	* *	J197	LIPL SET UP	0800
*****	*	10H2	LIPL SET UP	0810
	*	20W34	LIPL SET UP	0820
	* 9-2	30W21	LIPL SET UP	0830
	*	30W22	LIPL SET UP	0840
	*	30W25	LIPL SET UP	0850
	*	30W30	LIPL SET UP	0860
	*	30W31	LIPL SET UP	0870
*****		119-415 J1	LIPL SET UP	0880
END	9-10 +01	1	LIPL SET UP	0890
*****	9-11 +01	1	LIPL SET UP	0900
9-100 BRANCH ON CURRENT CHARACTER	9-100 109-101		LIPL 9-100	0910
	11W9		LIPL 9-100	0920
IF LETTER GO TO 9-105	J10		LIPL 9-100	0930
IF 8 GO TO 9-106	70	J1	LIPL 9-100	0940
IF 9 GO TO 9-107	11W9		LIPL 9-100	0950
IF + GO TO 9-134	J130		LIPL 9-100	0960
IF - GO TO 9-135	709-155	9-105	LIPL 9-100	0970
IF \$ GO TO 9-136	9-101+ 9-102 0		LIPL 9-100	0980
IF / GO TO 9-137	9-102+ 0		LIPL 9-100	0990
IF . GO TO 9-151	9-103+ *		LIPL 9-100	1000
IF (GO TO 9-152	+ 9-104		LIPL 9-100	1010
IF , GO TO 9-167	+ +		LIPL 9-100	1020
IF ' GO TO 9-166	+ 9-134		LIPL 9-100	1030
IF) GO TO J4	+ -		LIPL 9-100	1040
IF OCTAL GO TO 9-155	+ 9-135		LIPL 9-100	1050
	+ .		LIPL 9-100	1060
	+ 9-151		LIPL 9-100	1070
	+ ,		LIPL 9-100	1080
	+ 9-167		LIPL 9-100	1090
	+ \$		LIPL 9-100	1100
	+ 9-136		LIPL 9-100	1110
	+)		LIPL 9-100	1120
	+ J4		LIPL 9-100	1130
	+ (LIPL 9-100	1140
	+ 9-152		LIPL 9-100	1150
	+ '		LIPL 9-100	1160
	+ 9-166		LIPL 9-100	1170
	+ /		LIPL 9-100	1180
	+ 9-137		LIPL 9-100	1190

NOTE--IT IS IMPOSSIBLE
FOR THE CURRENT
CHARACTER TO BE AN
'=' AT THIS POINT
IN THE PROGRAM.

	*	+	8	LIPL	9-100	1200	
	*	+	9-106	LIPL	9-100	1210	
	*	+	9	LIPL	9-100	1220	
	**	+	9-107 0	LIPL	9-100	1230	
104 FIND NEXT CHARACTER		9-104	9-510	LIPL	9-100	1240	
105 IF COPY FLAG IS ON,		9-105	019-404	LIPL	9-100	1250	
GO TO 9-120		70	9-120	LIPL	9-100	1260	
PUT SYMBOL IN H0			9-560	LIPL	9-100	1270	
IF NOT A PSEUDO, GO TO 9-110		70	9-110	LIPL	9-100	1280	
EXECUTE PSEUDO			J1	LIPL	9-100	1290	
STOP IF PSEUDO LEAVES H5 -		70 0		LIPL	9-100	1300	
FIND CURRENT CHARACTER, GO 9-100			9-500 9-100	LIPL	9-100	1310	
120 ADD AN EMPTY CELL TO LIST TWO		9-120	9-770	LIPL	9-100	1320	
CREAT A CELL IN H0			9-520	LIPL	9-100	1330	
PUT SYMBOL IN H0, GO TO 9-131			9-560 9-131	LIPL	9-100	1340	
106 IF COPY FLAG IS ON,		9-106	019-404	LIPL	9-100	1350	
GO TO 9-108		70	9-108	LIPL	9-100	1360	
PUT J3 IN H0			10J3	LIPL	9-100	1370	
PUT SYMBOL IN H0, GO TO 9-110			9-560 9-110	LIPL	9-100	1380	
107 IF COPY FLAG IS ON,		9-107	019-404	LIPL	9-100	1390	
GO TO 9-109		70	9-109	LIPL	9-100	1400	
PUT J4 IN H0			10J4	LIPL	9-100	1410	
PUT SYMBOL IN H0			9-580 9-110	LIPL	9-100	1420	
108 ADD AN EMPTY CELL TO LIST TWO		9-108	9-770	LIPL	9-100	1430	
CREAT A CELL IN H0			9-520	LIPL	9-100	1440	
PUT J3 IN H0			10J3	LIPL	9-100	1450	
PUT SYMBOL IN H0, GO TO 9-131			9-580 9-131	LIPL	9-100	1460	
109 ADD AN EMPTY CELL TO LIST TWO		9-109	9-770	LIPL	9-100	1470	
CREAT A CELL IN H0			9-520	LIPL	9-100	1480	
MAKE IT LOCAL			J136	LIPL	9-100	1490	
PUT J4 IN H0			10J4	LIPL	9-100	1500	
PUT SYMBOL IN H0, GO TO 9-131			9-580 9-131	LIPL	9-100	1510	
110 FIND CURRENT CHARACTER		9-110	9-500	LIPL	9-100	1520	
111 BRANCH ON CURRENT CHARACTER****		9-111	109-112	LIPL	9-100	1530	
	*		11W9	LIPL	9-100	1540	
IF ' GO TO 9-114	*		J10	LIPL	9-100	1550	
IF = GO TO 9-115	*		70	J1	LIPL	9-100	1560
	*		9-760 9-100	LIPL	9-100	1570	
ELSE ADD (0) TO LIST	*	9-112+	9-113 0	LIPL	9-100	1580	
AND GO TO 9-100	*	9-113+	0	LIPL	9-100	1590	
	*	+	'	LIPL	9-100	1600	
	*	+	9-114	LIPL	9-100	1610	
	*	+	=	LIPL	9-100	1620	
	**	+	9-115 0	LIPL	9-100	1630	
114 SKIP COMMNT OR SET COPY, 9-111		9-114	9-750 9-111	LIPL	9-100	1640	
115 FIND NEXT CHARACTER		9-115	9-510	LIPL	9-100	1650	
116 BRANCH ON CURRENT CHARACTER****		9-116	109-117	LIPL	9-100	1660	
	*		11W9	LIPL	9-100	1670	
IF LETTER GO TO 9-123	*		J10	LIPL	9-100	1680	
IF ' GO TO 9-119	*		709-123 J1	LIPL	9-100	1690	
IF + GO TO 9-141	*	9-117+	9-118 0	LIPL	9-100	1700	
IF - GO TO 9-142	*	9-118+	0	LIPL	9-100	1710	
IF \$ GO TO 9-143	*	+	'	LIPL	9-100	1720	
IF / GO TO 9-144	*	+	9-119	LIPL	9-100	1730	
IF 8 GO TO 9-125	*	+	.	LIPL	9-100	1740	
IF 9 GO TO 9-126	*	+	9-121	LIPL	9-100	1750	
IF * GO TO 9-122	*	+	+	LIPL	9-100	1760	
IF (GO TO 9-153	*	+	9-141	LIPL	9-100	1770	
IF . GO TO 9-121	*	+	-	LIPL	9-100	1780	

NOTE--IT IS IMPOSSIBLE	*	+	9-142	LIPL	9-100	1790
FOR THE CURRENT	*	+	\$	LIPL	9-100	1800
CHARACTER TO BE AN	*	+	9-143	LIPL	9-100	1810
OCTAL, AN 'A', A	*	+	/	LIPL	9-100	1820
'I', OR A 'I' AT	*	+	9-144	LIPL	9-100	1830
THIS POINT IN THE	*	+	8	LIPL	9-100	1840
PROGRAM.	*	+	9-125	LIPL	9-100	1850
	*	+	9	LIPL	9-100	1860
	*	+	9-126	LIPL	9-100	1870
	*	+	*	LIPL	9-100	1880
	*	+	9-122	LIPL	9-100	1890
	*	+	I	LIPL	9-100	1900
	**	+	9-153 0	LIPL	9-100	1910
119 SKIP COMMNT OR SET COPY, 9-116		9-119	9-750 9-116	LIPL	9-100	1920
121 SET ERASE FLAG		9-121	10J4	LIPL	9-100	1930
GO TO 9-115			209-405 9-115	LIPL	9-100	1940
122 FIND NEXT CHARACTER		9-122	9-510	LIPL	9-100	1950
123 IF COPY FLAG IS NOT ON,		9-123	019-404	LIPL	9-100	1960
GO TO 9-124			709-124	LIPL	9-100	1970
PUT SYMBOL IN H0, GO TO 9-131.			9-560 9-131	LIPL	9-100	1980
124 PUT SYMBOL IN H0		9-124	9-560	LIPL	9-100	1990
IF NOT A PSEUDO, GO TO 9-132			70 9-132	LIPL	9-100	2000
EXECUTE PSEUDO			J1	LIPL	9-100	2010
STOP IS PSEUDO LEAVES H5 -			70 0	LIPL	9-100	2020
FIND CURRENT CHARACTER, GO 9-116			9-500 9-116	LIPL	9-100	2030
125 PUT J3 IN H0, GO TO 9-127		9-125	10J3 9-127	LIPL	9-100	2040
126 PUT J4 IN H0		9-126	10J4	LIPL	9-100	2050
127 IF COPY FLAG IS NOT ON		9-127	019-404	LIPL	9-100	2060
GO TO 9-128			709-128	LIPL	9-100	2070
PUT SYMBOL IN H0, GO TO 9-131			9-580 9-131	LIPL	9-100	2080
128 PUT SYMBOL IN H0, GO TO 9-132		9-128	9-580 9-132	LIPL	9-100	2090
129 WORK CELL		9-129+	0 0	LIPL	9-100	2100
131	*****	9-131	209-129	LIPL	9-100	2110
AT THIS POINT IN THE	*		209-133	LIPL	9-100	2120
PROGRAM (0) IS THE	*		119-129	LIPL	9-100	2130
INTERNAL NAME OF A.	*		119-133	LIPL	9-100	2140
COPY OF THE STRUCTURE	*		J121	LIPL	9-100	2150
NAMED BY THE LAST	*		J8	LIPL	9-100	2160
SYMBOL READ. (1) IS THE	*		01W1	LIPL	9-100	2170
2ND LAST SYMBOL READ--	*		70 9-138	LIPL	9-100	2180
THE 'NAME' THE USER	*		119-129	LIPL	9-100	2190
WANTS THE COPY TO HAVE.	*		11W0	LIPL	9-100	2200
(1) IS MADE IDENTICAL	*		J197	LIPL	9-100	2210
TO (0) AND (1) IS ADDED	*		119-129	LIPL	9-100	2220
TO THE LIST 1W0. THE	*		J124	LIPL	9-100	2230
CELL ON LIST 1W0 INTO	*		20WC 9-139	LIPL	9-100	2240
WHICH (1) IS PLACED	*	9-138	10J3	LIPL	9-100	2250
IS INSERTED INTO THE	*		20W1	LIPL	9-100	2260
PRINT LIST JUST BEFORE	*	9-139	119-133	LIPL	9-100	2270
THE COPY AND THE	*		21WC	LIPL	9-100	2280
ORIGINAL NAME	*		119-416	LIPL	9-100	2290
OF THE COPY IS REPLACED	*		J60	LIPL	9-100	2300
BY THE SYMBOL (1) ON THE	*		209-416	LIPL	9-100	2310
PRINT LIST.	*		419-416	LIPL	9-100	2320
	*		11W0	LIPL	9-100	2330
THEN THE CURRENT	*		219-416	LIPL	9-100	2340
CHARACTER IS FOUND	*		119-416	LIPL	9-100	2350
AND THE PROGRAM LINKS	*		J60	LIPL	9-100	2360
TO 9-100.	*		J60	LIPL	9-100	2370
	*		209-416	LIPL	9-100	2380

	*	119-133	LIPL 9-100	2390
	*	219-416	LIPL 9-100	2400
	**	9-500 9-100	LIPL 9-100	2410
132 (0) IS A NEUMONIC AND	***** 9-132	J6	LIPL 9-100	2420
(1) IS A SYMBOL. (0)	*	209-129	LIPL 9-100	2430
IS MADE EQUIVALENT TO	*	109-400	LIPL 9-100	2440
(1) IN THE NEUMONIC	*	J6	LIPL 9-100	2450
TABLE. THE PROGRAM	*	J62	LIPL 9-100	2460
THEN LINKS TO 9-110.	*	209-133	LIPL 9-100	2470
	*	119-129	LIPL 9-100	2480
	**	619-133 9-110	LIPL 9-100	2490
133 WORKING CELL	9-133+	0 0	LIPL 9-100	2500
134 ADD AN EMPTY CELL TO LIST 1W0	9-134	9-770	LIPL 9-100	2510
CREAT A CELL IN H0		9-520	LIPL 9-100	2520
MAKE IT LOCAL, GO TO 9-141		J136 9-141	LIPL 9-100	2530
135 ADD AN EMPTY TO LIST 1W0	9-135	9-770	LIPL 9-100	2540
CREAT A CELL IN H0		9-520	LIPL 9-100	2550
MAKE IT LOCAL, GO TO 9-142		J136 9-142	LIPL 9-100	2560
136 ADD EN EMPTY CELL TO LIST 1W0	9-136	9-770	LIPL 9-100	2570
CREAT A CELL IN H0		9-520	LIPL 9-100	2580
MAKE IT LOCAL, GO TO 9-143		J136 9-143	LIPL 9-100	2590
137 ADD AN EMPTY CELL TO LIST 1W0	9-137	9-770	LIPL 9-100	2600
CREAT A CELL IN H0		9-520	LIPL 9-100	2610
MAKE IT LOCAL, GO TO 9-144		J136 9-144	LIPL 9-100	2620
141 ADD (0) TO LIST 1W0,	9-141	40H0	LIPL 9-100	2630
LEAVE (0), GO TO 9-145		9-760 9-145	LIPL 9-100	2640
145 ADD (0) TO LIST 1W0,	9-142	40H0	LIPL 9-100	2650
LEAVE (0), GO TO 9-146		9-760 9-146	LIPL 9-100	2660
143 ADD (0) TO LIST 1W0,	9-143	40H0	LIPL 9-100	2670
LEAVE (0), GO TO 9-147		9-760 9-147	LIPL 9-100	2680
144 ADD (0) TO LIST 1W0,	9-144	40H0	LIPL 9-100	2690
LEAVE (0), GO TO 9-148		9-760 9-148	LIPL 9-100	2700
145 SET NEUMERIC DATA IN (0)	9-145	9-630	LIPL 9-100	2710
POP H0, GO TO 9-149		J8 9-149	LIPL 9-100	2720
146 SET NEUMERIC DATA IN (0)	9-146	9-630	LIPL 9-100	2730
MAKE (0) NEGATIVE.		J123	LIPL 9-100	2740
POP H0, GO TO 9-149		J8 9-149	LIPL 9-100	2750
147 SET BCD DATA IN (0)	9-147	9-650	LIPL 9-100	2760
POP H0, GO TO 9-149		J8 9-149	LIPL 9-100	2770
148 SET OCTAL DATA IN (0)	9-148	9-620	LIPL 9-100	2780
POP H0, GO TO 9-149		J8 9-149	LIPL 9-100	2790
149 FIND CURRENT CHARACTER,GO 9-100	9-149	9-500 9-100	LIPL 9-100	2800
151 SET ERASE FLAG	9-151	10J4	LIPL 9-100	2810
		209-405	LIPL 9-100	2820
FIND NEXT CHARACTER,GO TO 9-100		9-510 9-100	LIPL 9-100	2830
152 ADD EN EMPTY CELL TO LIST 1W0	9-152	9-770	LIPL 9-100	2840
CREAT A CELL IN H0		9-520	LIPL 9-100	2850
MAKE IT LOCAL		J136	LIPL 9-100	2860
153	9-153	609-129	LIPL 9-100	2870
ADD (0) TO LIST 1W0		9-760	LIPL 9-100	2880
		119-129	LIPL 9-100	2890
IF (0) IS NOT REGIONAL,		J130	LIPL 9-100	2900
GO TO 9-154		709-154	LIPL 9-100	2910
IF NOT AT THE TOP LEVEL,		01W4	LIPL 9-100	2920
GO TO 9-154		709-154	LIPL 9-100	2930
RESET LOCAL SYMBOL TABLE *****		109-402	LIPL 9-100	2940
	*	J80	LIPL 9-100	2950
	*	709-154	LIPL 9-100	2960
	*	J71	LIPL 9-100	2970

	*	10 0		LIPL 9-100	2980
	**	209-402		LIPL 9-100	2990
154 SET UP W0-W4 FOR SUBLIST *****	9-154	10J3		LIPL 9-100	3000
	*	10 9		LIPL 9-100	3010
	*	10 9		LIPL 9-100	3020
	*	10J4		LIPL 9-100	3030
	*	119-129		LIPL 9-100	3040
	**	J54		LIPL 9-100	3050
FIND NEXT CHARACTER		9-510		LIPL 9-100	3060
PUT 'BEGIN SUBLIST' SYMBOL ON		119-407		LIPL 9-100	3070
PRINT LIST		109-409		LIPL 9-100	3080
		J65		LIPL 9-100	3090
DO 9-100 RECURSIVELY		9-100		LIPL 9-100	3100
PUT 'END SUBLIST' SYMBOL ON		119-407		LIPL 9-100	3110
PRINT LIST		109-410		LIPL 9-100	3120
		J65		LIPL 9-100	3130
POP W0-W4		J34		LIPL 9-100	3140
STOP IF H5 -		70 0		LIPL 9-100	3150
FIND NEXT CHARACTER,GO TO 9-149		9-510 9-149		LIPL 9-100	3160
155 PUT CURRENT CHARACTER IN H0	9-155	11W9		LIPL 9-100	3170
FIND NEXT CHARACTER		9-510		LIPL 9-100	3180
IF BLANK(S), GO TO 9-164		709-164		LIPL 9-100	3190
156 BRANCH ON CURRENT CHARACTER****	9-156	109-157		LIPL 9-100	3200
	*	11W9		LIPL 9-100	3210
IF OCTAL GO TO 9-162	*	J10		LIPL 9-100	3220
IF ' GO TO 9-159	*	70	J1	LIPL 9-100	3230
IF , GO TO 9-164	*	11W9		LIPL 9-100	3240
IF) GO TO 9-164	*	J130		LIPL 9-100	3250
	*	709-162 9-161		LIPL 9-100	3260
ELSE GO TO 9-161	*	9-157+ 9-158 0		LIPL 9-100	3270
	*	9-158+ 0		LIPL 9-100	3280
	*	+		LIPL 9-100	3290
	*	+	9-159	LIPL 9-100	3300
	*	+	,	LIPL 9-100	3310
	*	+	9-164	LIPL 9-100	3320
	*	+)	LIPL 9-100	3330
	*	+	9-164	LIPL 9-100	3340
	*	+	8	LIPL 9-100	3350
	*	+	9-161	LIPL 9-100	3360
	*	+	9	LIPL 9-100	3370
	**	+	9-161 0	LIPL 9-100	3380
159 SKIP COMMENT OR SET COPY, 9-116	9-159	9-750 9-156		LIPL 9-100	3390
161 PUT (0) IN W3 (Q), GO TO 9-100	9-161	20W3 9-100		LIPL 9-100	3400
162 PUT CURRENT CHARACTER IN W3 (Q)	9-162	11W9		LIPL 9-100	3410
AND (0) IN W2 (P)		20W3		LIPL 9-100	3420
		20W2		LIPL 9-100	3430
FIND NEXT CHARACTER		9-510		LIPL 9-100	3440
IF NO BLANK(S), GO TO 9-165		70 9-165		LIPL 9-100	3450
163 PUT AN INTERNAL ZERO IN H0	9-163	10 0		LIPL 9-100	3460
		J138		LIPL 9-100	3470
164 ADD (0) TO LIST 1W0,GO TO 9-100	9-164	9-760 9-100		LIPL 9-100	3480
165 IS CURRENT CHARACTER ZERO	9-165	11W9		LIPL 9-100	3490
		10 0		LIPL 9-100	3500
		J2		LIPL 9-100	3510
IF NOT, GO TO 9-100		709-100		LIPL 9-100	3520
IF SO, FIND NEXT CHAR, GO 9-163		9-510 9-163		LIPL 9-100	3530
166 SKIP COMMENT OR SET COPY, 9-116	9-166	9-750 9-100		LIPL 9-100	3540
167 FIND NEXT CHARACTER	9-167	9-510		LIPL 9-100	3550
168 BRANCH ON CURRENT CHARACTER****	9-168	109-169		LIPL 9-100	3560
	*	11W9		LIPL 9-100	3570

IF LETTER GO TO 9-175	*	J10		LIPL 9-100	3580
IF 8 GO TO 9-176	*	709-175	J1	LIPL 9-100	3590
IF 9 GO TO 9-177	*	9-169+	9-171 0	LIPL 9-100	3600
IF ' GO TO 9-172	*	9-171+	0	LIPL 9-100	3610
IF . GO TO 9-173	*	+	'	LIPL 9-100	3620
IF * GO TO 9-174	*	+	9-172	LIPL 9-100	3630
	*	+	8	LIPL 9-100	3640
NOTE--IT IS IMPOSSIBLE	*	+	9-176	LIPL 9-100	3650
FOR THE CURRENT	*	+	9	LIPL 9-100	3660
CHARACTER TO BE AN	*	+	9-177	LIPL 9-100	3670
OCTAL, AN '=' , A '('	*	+	.	LIPL 9-100	3680
A ')', A '+', A '-',	*	+	9-173	LIPL 9-100	3690
A '/', OR A '\$' AT THIS	*	+	*	LIPL 9-100	3700
POINT IN THE PROGRAM.	**	+	9-174 0	LIPL 9-100	3710
172 SKIP COMMNT OR SET COPY, 9-168		9-172	9-750 9-168	LIPL 9-100	3720
173 SET ERASE FLAG		9-173	10J4	LIPL 9-100	3730
			209-405	LIPL 9-100	3740
FIND NEXT CHARACTER,GO TO 9-168			9-510 9-168	LIPL 9-100	3750
174 FIND NEXT CHARACTER		9-174	9-510	LIPL 9-100	3760
175 PUT SYMBOL IN H0, GO TO 9-179		9-175	9-560 9-179	LIPL 9-100	3770
176 PUT J3 IN H0, GO TO 9-178		9-176	10J3 9-178	LIPL 9-100	3780
177 PUT J4 IN H0		9-177	10J4	LIPL 9-100	3790
178 PUT SYMBOL IN H0		9-178	9-580	LIPL 9-100	3800
179 SET LINK OF CELL 1W0 TO (0)		9-179	40H0	LIPL 9-100	3810
			11W0	LIPL 9-100	3820
			J197	LIPL 9-100	3830
PUT (0) INTO W0			20W0	LIPL 9-100	3840
SET W1 (EMPTY FLAG) TO PLUS			10J4	LIPL 9-100	3850
			20W1	LIPL 9-100	3860
FIND CURRENT CHARACTER,GO 9-100			9-500 9-100	LIPL 9-100	3870
200 'NEUMONIC TABLE'		9-200+	0	LIPL PRINT	LTS3880
		+	9-202	LIPL PRINT	LTS3890
		+	9-203	LIPL PRINT	LTS3900
		9-201+	9-204	LIPL PRINT	LTS3910
		+	9-205 0	LIPL PRINT	LTS3920
		9-202+	21NEUM	LIPL PRINT	LTS3930
		9-203+	21ONIC	LIPL PRINT	LTS3940
		9-204+	21 TAB	LIPL PRINT	LTS3950
		9-205+	21LE	LIPL PRINT	LTS3960
210 'INTERNAL TBLE'		9-210+	0	LIPL PRINT	LTS3970
		+	9-211	LIPL PRINT	LTS3980
		+	9-212 9-201	LIPL PRINT	LTS3990
		9-211+	21INTE	LIPL PRINT	LTS4000
		9-212+	21RNAL	LIPL PRINT	LTS4010
		9-221+	21ERROR	LIPL PRINT	LTS4020
		9-222+	21--NO	LIPL PRINT	LTS4030
		9-223+	21 MORE	LIPL PRINT	LTS4040
		9-224+	21 CARD	LIPL PRINT	LTS4050
		9-225+	21S ON	LIPL PRINT	LTS4060
		9-226+	21 UNIT	LIPL PRINT	LTS4070
		9-227+	21 1w18	LIPL PRINT	LTS4080
		9-228+	21--LIP	LIPL PRINT	LTS4090
		9-229+	21L REA	LIPL PRINT	LTS4100
		9-230+	21D GRO	LIPL PRINT	LTS4110
		9-231+	21UP IN	LIPL PRINT	LTS4120
		9-232+	21COMPL	LIPL PRINT	LTS4130
		9-233+	21ETE	LIPL PRINT	LTS4140
220 'ERROR--NO MORE CARDS'		9-220+	0	LIPL PRINT	LTS4150
		+	9-221	LIPL PRINT	LTS4160

	+	9-222		LIPL PRINT LTS4170
	+	9-223		LIPL PRINT LTS4180
	+	9-224		LIPL PRINT LTS4190
	+	9-225		LIPL PRINT LTS4200
	+	9-226		LIPL PRINT LTS4210
	+	9-227		LIPL PRINT LTS4220
	+	9-228		LIPL PRINT LTS4230
	+	9-229		LIPL PRINT LTS4240
	+	9-230		LIPL PRINT LTS4250
	+	9-231		LIPL PRINT LTS4260
	+	9-232		LIPL PRINT LTS4270
	+	9-233	0	LIPL PRINT LTS4280
300 PSEUDOS	9-300+	9-301		LIPL PSEUDOS 4290
	+	9-311		LIPL PSEUDOS 4300
	+	9-302		LIPL PSEUDOS 4310
	+	9-312		LIPL PSEUDOS 4320
	+	9-303		LIPL PSEUDOS 4330
	+	9-313		LIPL PSEUDOS 4340
	+	9-304		LIPL PSEUDOS 4350
	+	9-324		LIPL PSEUDOS 4360
	+	9-305		LIPL PSEUDOS 4370
	+	9-315		LIPL PSEUDOS 4380
	+	9-306		LIPL PSEUDOS 4390
	+	9-316		LIPL PSEUDOS 4400
	+	9-307		LIPL PSEUDOS 4410
	+	9-317		LIPL PSEUDOS 4420
	+	9-308		LIPL PSEUDOS 4430
	+	9-318		LIPL PSEUDOS 4440
	+	9-309		LIPL PSEUDOS 4450
	+	9-319		LIPL PSEUDOS 4460
	+	9-310		LIPL PSEUDOS 4470
	+	9-320	0	LIPL PSEUDOS 4480
	9-301+21ND			LIPL PSEUDOS 4490
	9-302+21DT			LIPL PSEUDOS 4500
	9-303+21RT			LIPL PSEUDOS 4510
	9-304+21GT			LIPL PSEUDOS 4520
	9-305+21RN			LIPL PSEUDOS 4530
	9-306+21RI			LIPL PSEUDOS 4540
	9-307+21PN			LIPL PSEUDOS 4550
	9-308+21PI			LIPL PSEUDOS 4560
	9-309+21NL			LIPL PSEUDOS 4570
	9-310+21TR			LIPL PSEUDOS 4580
311 PSEUDO 'ND'--STOP PROGRAM	9-311	J3	0	LIPL PSEUDOS 4590
312 PSEUDO 'DT'--SET DATA MODE FLG+	9-312	10J4		LIPL PSEUDOS 4600
		209-411	J4	LIPL PSEUDOS 4610
313 PSEUDO 'RT'--SET DATA FLG MODE-	9-313	10J3		LIPL PSEUDOS 4620
		209-411	J4	LIPL PSEUDOS 4630
315 PSEUDO 'RN'--ERASE NEUMONIC TBL	9-315	109-400		LIPL PSEUDOS 4640
	9-321	J60		LIPL PSEUDOS 4650
		709-322		LIPL PSEUDOS 4660
		12HC		LIPL PSEUDOS 4670
		J9		LIPL PSEUDOS 4680
		J60	9-321	LIPL PSEUDOS 4690
	9-322	509-400		LIPL PSEUDOS 4700
		J75		LIPL PSEUDOS 4710
		J71	J4	LIPL PSEUDOS 4720
316 PSEUDO 'RI'--ERASE INTERNAL TBL	9-316	109-403		LIPL PSEUDOS 4730
		J15	J4	LIPL PSEUDOS 4740
317 PSEUDO 'PN'--SET FLAG 9-418 +	9-317	10J4		LIPL PSEUDOS 4750
		209-418	J4	LIPL PSEUDOS 4760

318 PSEUDO 'PI'--SET FLAG 9-419 +	9-318 10J4		LIPL PSEUDOS 4770
	209-419 J4		LIPL PSEUDOS 4780
319 PSEUDO 'NL'--SET FLAG 9-417 -	9-319 10J3		LIPL PSEUDOS 4790
	209-417 J4		LIPL PSEUDOS 4800
320 PSEUDO 'TR'--TRACE LIPL	9-320 109-901		LIPL PSEUDOS 4810
LIPL DEBUGGING AID	20W31		LIPL PSEUDOS 4820
URNS ON FULL TRACE	03J4	0	LIPL PSEUDOS 4830
324 PSEUDO 'GT'--FIND NEXT	9-324 9-500		LIPL PSEUDOS 4840
SYMBOL, PUT IT IN 9-415,	109-326		LIPL PSEUDOS 4850
AND STOP PROGRAM	11W9		LIPL PSEUDOS 4860
	J10		LIPL PSEUDOS 4870
	70	J1	LIPL PSEUDOS 4880
9-325 9-560			LIPL PSEUDOS 4890
	209-415 J3		LIPL PSEUDOS 4900
9-326+ 9-327 0			LIPL PSEUDOS 4910
9-327+ 0			LIPL PSEUDOS 4920
+ *			LIPL PSEUDOS 4930
+ 9-328			LIPL PSEUDOS 4940
+ 9			LIPL PSEUDOS 4950
+ 9-329			LIPL PSEUDOS 4960
+ E			LIPL PSEUDOS 4970
+ 9-331 0			LIPL PSEUDOS 4980
9-328 9-510 9-325			LIPL PSEUDOS 4990
9-329 10J4 9-332			LIPL PSEUDOS 5000
9-331 10J3			LIPL PSEUDOS 5010
9-332 9-580			LIPL PSEUDOS 5020
	209-415 J3		LIPL PSEUDOS 5030
9-400+ 0	0		LIPL WORK CELS5040
9-401+ 0	9-300		LIPL WORK CELS5050
9-402+ 0	0		LIPL WORK CELS5060
9-403+ 0	0		LIPL WORK CELS5070
9-404+ J3	0		LIPL WORK CELS5080
9-405+ J3	0		LIPL WORK CELS5090
9-406+ 0	0		LIPL WORK CELS5100
9-407+ 9-406 0			LIPL WORK CELS5110
9-411+ J4	0		LIPL WORK CELS5120
9-413+01	0		LIPL WORK CELS5130
9-414+ 0	0		LIPL WORK CELS5140
9-415+ J0	0		LIPL WORK CELS5150
9-416+ 0	0		LIPL WORK CELS5160
9-417+ J4	0		LIPL WORK CELS5170
9-418+ J3	0		LIPL WORK CELS5180
9-419+ J3	0		LIPL WORK CELS5190
9-500 11W25			LIPL9-500/510 5200
	109-981		LIPL9-500/510 5210
	J115		LIPL9-500/510 5220
	709-511		LIPL9-500/510 5230
	J186		LIPL9-500/510 5240
	709-501		LIPL9-500/510 5250
	20W9	0	LIPL9-500/510 5260
9-501 11W25			LIPL9-500/510 5270
	J184		LIPL9-500/510 5280
	J8		LIPL9-500/510 5290
	709-511		LIPL9-500/510 5300
	J186	9-512	LIPL9-500/510 5310
9-510 109-901			LIPL9-500/510 5320
	J161	9-500	LIPL9-500/510 5330
9-511 9-600			LIPL9-500/510 5340
	J186		LIPL9-500/510 5350

MNEMONIC TABLE	
PSEUDO TABLE	
LOCAL TABLE	
INTERNAL TABLE	
COPY FLAG	
ERASE FLAG	
PRINT LIST	
LAST CELL OF PRINT LIST	
DATA MODE FLAG	
INTEGER CARD COUNT	
W32=H2 AT START Y/N	
LINK TO THIS ROUTINE	
CELL IN PRT LIST BEFORE LAST COPY	
LISTING DESIRED Y/N	
MNEMONIC TABLE DESIRED Y/N	
INTERNAL TABLE DESIRED Y/N	
S/R--FIND CURRENT CHARACTER	
IF CHARACTER IN PRINT LINE 1W24	
AT COLUMN 1W25 IS NON-BLANK,	
PUT IT IN W9 AND SET H5+.	
IF BLANK, FIND NEXT NON-BLANK	
AND PUT IT IN W9 WITH H5-.	
READ AND PRINT CARDS IF NEEDED.	
S/R--FIND NEXT CHARACTER	
IF CHARACTER IN PRINT LINE 1W24	
AT 1W25 + 1 IS NON-BLANK,	
PUT IT IN W9 AND SET H5+.	

IF BLANK, FIND NEXT NON-BLANK
AND PUT IT IN W9 WITH H5-.
S/R--CREATE A CELL

IF LIST 1W34 IS EMPTY, H2 IS
PUT INTO W34 AND 9-520 BECOMES
ROUTINE J90.
OTHERWISE IT REMOVES THE FIRST
LIST CELL, LEAVES IT IN H0,
AND MAKES ITS LINK THE LINK OF
1W34. THE CELL IS CLEARED.

THE SYMBOL CREATED IS NEITHER
LOCAL NOR INTERNAL.

S/R--SCAN FOR) OR , OR = OR BLANK

SET 1W30 TO THE NEXT OCCURANCE
OF) OR , OR = OR BLANK.
NO INPUTS OR OUTPUTS.

709-501		LIPL9-500/510	5360
9-512 20W9	J3	LIPL9-500/510	5370
9-520 9-521	0	LIPL 9-520	5380
9-521 11W34		LIPL 9-520	5390
J60		LIPL 9-520	5400
709-522		LIPL 9-520	5410
40H0		LIPL 9-520	5420
J193		LIPL 9-520	5430
11W34		LIPL 9-520	5440
J197	J124	LIPL 9-520	5450
9-522 50H2		LIPL 9-520	5460
20W34		LIPL 9-520	5470
10J90		LIPL 9-520	5480
109-520		LIPL 9-520	5490
J121		LIPL 9-520	5500
J8	J90	LIPL 9-520	5510
9-530 109-556		LIPL9-530/540	5520
J124		LIPL9-530/540	5530
J183		LIPL9-530/540	5540
109-557		LIPL9-530/540	5550
J124		LIPL9-530/540	5560
10,		LIPL9-530/540	5570
J185		LIPL9-530/540	5580
109-558		LIPL9-530/540	5590
J124		LIPL9-530/540	5600
10)		LIPL9-530/540	5610
J185		LIPL9-530/540	5620
109-559		LIPL9-530/540	5630
J124		LIPL9-530/540	5640
10=		LIPL9-530/540	5650
J185		LIPL9-530/540	5660
J116		LIPL9-530/540	5670
709-532		LIPL9-530/540	5680
J116		LIPL9-530/540	5690
709-531		LIPL9-530/540	5700
109-559		LIPL9-530/540	5710
109-557		LIPL9-530/540	5720
J116		LIPL9-530/540	5730
709-554	9-552	LIPL9-530/540	5740
9-531 109-559		LIPL9-530/540	5750
109-556		LIPL9-530/540	5760
J116		LIPL9-530/540	5770
709-554	9-551	LIPL9-530/540	5780
9-532 J116		LIPL9-530/540	5790
709-533		LIPL9-530/540	5800
109-558		LIPL9-530/540	5810
109-557		LIPL9-530/540	5820
J116		LIPL9-530/540	5830
709-553	9-552	LIPL9-530/540	5840
9-533 109-558		LIPL9-530/540	5850
109-556		LIPL9-530/540	5860
J116		LIPL9-530/540	5870
709-553	9-551	LIPL9-530/540	5880
9-540 109-556		LIPL9-530/540	5890
J124		LIPL9-530/540	5900
J183		LIPL9-530/540	5910
109-557		LIPL9-530/540	5920
J124		LIPL9-530/540	5930
10)		LIPL9-530/540	5940
J185		LIPL9-530/540	5950

S/R--SCAN FOR) OR , OR BLANK

SET 1W30 TO THE NEXT OCCURANCE
OF) OR , OR BLANK.
NO INPUTS OR OUTPUTS.

S/R--OUTPUT SYMBOL GIVEN LETTER

THIS ROUTINE ASSUMES THERE IS A
LETTER AT 1W25 AND THAT THE
SYMBOL BEGINNING THERE IS
TERMINATED BY) OR , OR = OR
BLANK.
THE SYMBOL IS OUTPUT IN (0).
IF THE SYMBOL IS A PSEUDO H5

IS SET -.
OTHERWISE SUBROUTINE 9-600,
WHICH TAKES CARE OF ERASE AND
COPY, IS FIRED AND H5 IS SET +.
NEUMONIC LIST 9-400 IS USED.
PSEUDO LIST 9-401 IS USED.
SUBROUTINES 9-530 AND 9-600 ARE
USED. ALSO 9-520.

109-558		LIPL9-530/540	5960
J124		LIPL9-530/540	5970
109		LIPL9-530/540	5980
J180		LIPL9-530/540	5990
J116		LIPL9-530/540	6000
709-541		LIPL9-530/540	6010
109-558		LIPL9-530/540	6020
J115		LIPL9-530/540	6030
709-553	9-551	LIPL9-530/540	6040
9-541	109-557	LIPL9-530/540	6050
J115		LIPL9-530/540	6060
709-552	9-551	LIPL9-530/540	6070
9-551	109-556	9-555	LIPL9-530/540 6080
9-552	109-557	9-555	LIPL9-530/540 6090
9-553	109-558	9-555	LIPL9-530/540 6100
9-554	109-559	9-555	LIPL9-530/540 6110
9-555	20W30	0	LIPL9-530/540 6120
9-556+01		0	LIPL9-530/540 6130
9-557+01		0	LIPL9-530/540 6140
9-558+01		0	LIPL9-530/540 6150
9-559+01		0	LIPL9-530/540 6160
9-560	9-530	LIPL	9-560 6170
	109-901	LIPL	9-560 6180
	J161	LIPL	9-560 6190
	J186	LIPL	9-560 6200
	109-801	LIPL	9-560 6210
	J161	LIPL	9-560 6220
	709-566	LIPL	9-560 6230
	J134	LIPL	9-560 6240
	70	9-566	LIPL 9-560 6250
	11W30	LIPL	9-560 6260
	109-901	LIPL	9-560 6270
	J114	LIPL	9-560 6280
	70	9-566	LIPL 9-560 6290
	109-568	LIPL	9-560 6300
	J182	LIPL	9-560 6310
	509-401	LIPL	9-560 6320
	J60	LIPL	9-560 6330
	709-563	LIPL	9-560 6340
	12H0	LIPL	9-560 6350
	109-568	LIPL	9-560 6360
	J114	LIPL	9-560 6370
	70	9-562	LIPL 9-560 6380
	J60	9-561	LIPL 9-560 6390
9-562	J81	J3	LIPL 9-560 6400
9-563	509-400		LIPL 9-560 6410
9-564	J60		LIPL 9-560 6420
	709-565		LIPL 9-560 6430
	12H0		LIPL 9-560 6440
	109-568		LIPL 9-560 6450
	J114		LIPL 9-560 6460
	70	9-567	LIPL 9-560 6470
	J60	9-564	LIPL 9-560 6480
9-565	40H0		LIPL 9-560 6490
	109-568		LIPL 9-560 6500
	J120		LIPL 9-560 6510
	J136		LIPL 9-560 6520
	J65		LIPL 9-560 6530
	9-520		LIPL 9-560 6540

S/R--OUTPUT SYMBOL GIVEN 8 OR 9

IF (0) = J3 IT ASSUMES THAT
THERE IS AN 8 AT 1425.
IF (0) = J4 IT ASSUMES A 9.
IN EITHER CASE IT ASSUMES THE
SYMBOL IS TERMINATED BY) OR ;
OR = OR BLANK.
THE SYMBOL IS OUTPUT IN (0).
SUBROUTINE 9-600, WHICH TAKES
CARE OF COPY AND ERASE, IS
FIRED AND H5 IS SET +.
LOCAL LIST 9-402 IS USED.
INTERNAL LIST 9-403 IS USED.
SUBROUTINES 9-520, 9-530, AND
9-600 ARE USED.

J124	LIPL	9-560	6550		
J138	LIPL	9-560	6560		
609-569	LIPL	9-560	6570		
J65	LIPL	9-560	6580		
119-569	9-600	LIPL	9-560	6590	
9-566	J181	9-600	LIPL	9-560	6600
9-567	J81	9-600	LIPL	9-560	6610
9-568+21			LIPL	9-560	6620
9-569+	0	0	LIPL	9-560	6630
9-580	209-594		LIPL	9-580	6640
	109-901		LIPL	9-580	6650
	J161		LIPL	9-580	6660
	109-581		LIPL	9-580	6670
	J186		LIPL	9-580	6680
	J10		LIPL	9-580	6690
	709-584	J1	LIPL	9-580	6700
9-581+	9-582	0	LIPL	9-580	6710
9-582+	0		LIPL	9-580	6720
+	-		LIPL	9-580	6730
+	9-583		LIPL	9-580	6740
+	.		LIPL	9-580	6750
+	9-589		LIPL	9-580	6760
+	/		LIPL	9-580	6770
+	9-591	0	LIPL	9-580	6780
9-583	109-901		LIPL	9-580	6790
	J161		LIPL	9-580	6800
9-584	9-530		LIPL	9-580	6810
	019-594		LIPL	9-580	6820
	709-585		LIPL	9-580	6830
	109-402	9-586	LIPL	9-580	6840
9-585	109-403		LIPL	9-580	6850
9-586	J181		LIPL	9-580	6860
	609-596		LIPL	9-580	6870
	J10		LIPL	9-580	6880
	70	9-600	LIPL	9-580	6890
	019-594		LIPL	9-580	6900
	709-587		LIPL	9-580	6910
	109-402		LIPL	9-580	6920
	9-520		LIPL	9-580	6930
	J124		LIPL	9-580	6940
	J136	9-586	LIPL	9-580	6950
9-587	109-403		LIPL	9-580	6960
	9-520		LIPL	9-580	6970
	J124		LIPL	9-580	6980
	J138		LIPL	9-580	6990
9-588	609-595		LIPL	9-580	7000
	119-596		LIPL	9-580	7010
	J11		LIPL	9-580	7020
	119-595	9-600	LIPL	9-580	7030
9-589	109-901		LIPL	9-580	7040
	J161		LIPL	9-580	7050
	9-530		LIPL	9-580	7060
	J181		LIPL	9-580	7070
	019-594		LIPL	9-580	7080
	709-600		LIPL	9-580	7090
	J136	9-600	LIPL	9-580	7100
9-591	109-901		LIPL	9-580	7110
	J161		LIPL	9-580	7120
	9-530		LIPL	9-580	7130
	109-901		LIPL	9-580	7140

S/P--ERASE AND COPY IF REQUIRED

IF COPY FLAG IS ON STRUCTURE
(0) IS COPIED AND THE NAME OF
THE COPY IS LEFT AS OUTPUT (0).
THE COPY IS PUT ON THE PRINT
LIST.

IF ERASE FLAG IS ON THEN (0) IS
ERASED AS A STRUCTURE OR ROUTNE
DEPENDING ON THE DATA MODE FLAG
AND INPUT (0) IS OUTPUT (0).

CELL (0) IS NOT ERASED. IT IS
CLEARED.

IF THE COPY AND ERASE FLAGS ARE
BOTH ON THEN THE COPY IS MADE
AND THE ORIGINAL IS THEN ERASED.
IF NEITHER FLAG IS ON THEN
INPUT (0) IS OUTPUT (0).
IN ANY CASE H5 IS SET +.
THE COPY AND ERASE FLAGS ARE
TURNED OFF.

109-599		LIPL 9-580	7150
109-598		LIPL 9-580	7160
J128		LIPL 9-580	7170
J182		LIPL 9-580	7180
J128		LIPL 9-580	7190
109-801		LIPL 9-580	7200
J161		LIPL 9-580	7210
J159	9-589	LIPL 9-580	7220
9-594+	0 0	LIPL 9-580	7230
9-595+	0 0	LIPL 9-580	7240
9-596+	0 0	LIPL 9-580	7250
9-598+01	0	LIPL 9-580	7260
9-599+31		LIPL 9-580	7270
9-600 019-404		LIPL 9-600	7280
70	9-602	LIPL 9-600	7290
019-405		LIPL 9-600	7300
70J4		LIPL 9-600	7310
10J3		LIPL 9-600	7320
209-405		LIPL 9-600	7330
019-411		LIPL 9-600	7340
40H0		LIPL 9-600	7350
709-601		LIPL 9-600	7360
J120		LIPL 9-600	7370
J72		LIPL 9-600	7380
109-618		LIPL 9-600	7390
J6	J121	LIPL 9-600	7400
9-601 J201	J4	LIPL 9-600	7410
9-602 J50		LIPL 9-600	7420
119-407		LIPL 9-600	7430
J61		LIPL 9-600	7440
209-416		LIPL 9-600	7450
10J3		LIPL 9-600	7460
209-404		LIPL 9-600	7470
11W0		LIPL 9-600	7480
9-606		LIPL 9-600	7490
11W0		LIPL 9-600	7500
J132		LIPL 9-600	7510
709-603		LIPL 9-600	7520
J136	9-604	LIPL 9-600	7530
9-603 J138		LIPL 9-600	7540
9-604 119-619		LIPL 9-600	7550
J71		LIPL 9-600	7560
10 0		LIPL 9-600	7570
209-619		LIPL 9-600	7580
019-405		LIPL 9-600	7590
709-605		LIPL 9-600	7600
10J3		LIPL 9-600	7610
209-405		LIPL 9-600	7620
11W0		LIPL 9-600	7630
J120		LIPL 9-600	7640
J72		LIPL 9-600	7650
109-618		LIPL 9-600	7660
11W0		LIPL 9-600	7670
J121		LIPL 9-600	7680
J8	J30	LIPL 9-600	7690
9-605 J30	J4	LIPL 9-600	7700
9-606 40H0		LIPL 9-600	7710
109-619		LIPL 9-600	7720
J6		LIPL 9-600	7730

	J10	LIPL 9-600	7740
	709-607	LIPL 9-600	7750
	J6 J8	LIPL 9-600	7760
9-607	J42	LIPL 9-600	7770
	20W0	LIPL 9-600	7780
	109-619	LIPL 9-600	7790
	9-520	LIPL 9-600	7800
	60W1	LIPL 9-600	7810
	60W2	LIPL 9-600	7820
	11W0	LIPL 9-600	7830
	J11	LIPL 9-600	7840
	11W0	LIPL 9-600	7850
	J131	LIPL 9-600	7860
	709-608	LIPL 9-600	7870
	119-407	LIPL 9-600	7880
	109-408	LIPL 9-600	7890
	J65	LIPL 9-600	7900
	119-407	LIPL 9-600	7910
	11W1	LIPL 9-600	7920
	J65	LIPL 9-600	7930
	119-407	LIPL 9-600	7940
	J61	LIPL 9-600	7950
	209-407	LIPL 9-600	7960
	11W0	LIPL 9-600	7970
	11W1	LIPL 9-600	7980
	J136	LIPL 9-600	7990
	J121 J32	LIPL 9-600	8000
9-608	119-407	LIPL 9-600	8010
	109-409	LIPL 9-600	8020
	J65	LIPL 9-600	8030
9-609	119-407	LIPL 9-600	8040
	40H0	LIPL 9-600	8050
	11W1	LIPL 9-600	8060
	J65	LIPL 9-600	8070
	J61	LIPL 9-600	8080
	209-407	LIPL 9-600	8090
	12W0	LIPL 9-600	8100
	40H0	LIPL 9-600	8110
	J132	LIPL 9-600	8120
	709-611	LIPL 9-600	8130
	9-606	LIPL 9-600	8140
9-611	21W1	LIPL 9-600	8150
	11W0	LIPL 9-600	8160
	J60	LIPL 9-600	8170
	20W0	LIPL 9-600	8180
	709-612	LIPL 9-600	8190
	9-520	LIPL 9-600	8200
	40H0	LIPL 9-600	8210
	11W1	LIPL 9-600	8220
	J197	LIPL 9-600	8230
	20W1 9-609	LIPL 9-600	8240
9-612	10 0	LIPL 9-600	8250
	11W1	LIPL 9-600	8260
	J197	LIPL 9-600	8270
	119-407	LIPL 9-600	8280
	40H0	LIPL 9-600	8290
	109-410	LIPL 9-600	8300
	J65	LIPL 9-600	8310
	J60	LIPL 9-600	8320
	209-407	LIPL 9-600	8330

S/R--SET OCTAL DATA

(O) BECOMES OCTAL DATA TERM AT
1W25 AND TERMINATED BY , OR)
OR BLANK. IT LEAVES (O).
IT IS PUT ON THE PRINT LIST.
IT ASSUMES 1W25 IS A /.

S/R--SET NUMERIC DATA

(O) BECOMES THE INTEGER OR
FLOATING POINT DATA TERM AT
1W25 AND TERMINATED BY , OR)
OR BLANK. IT LEAVES (O).
IT IS PUT ON THE PRINT LIST.
IT ASSUMES 1W25 IS + OR -.
THE NUMBER OUTPUT IS ALWAYS
POSITIVE.

11W2			LIPL 9-600	8340
J136	J32		LIPL 9-600	8350
9-618+	0	0	LIPL 9-600	8360
9-619+	0	0	LIPL 9-600	8370
9-620	109-901		LIPL 9-620	8380
	J161		LIPL 9-620	8390
	109-621		LIPL 9-620	8400
	J6		LIPL 9-620	8410
	J121		LIPL 9-620	8420
	9-540		LIPL 9-620	8430
	J182		LIPL 9-620	8440
	119-407		LIPL 9-620	8450
	109-408		LIPL 9-620	8460
	J65		LIPL 9-620	8470
	40HC		LIPL 9-620	8480
	119-407		LIPL 9-620	8490
	J6		LIPL 9-620	8500
	J65		LIPL 9-620	8510
	119-407		LIPL 9-620	8520
	J61		LIPL 9-620	8530
	209-407	0	LIPL 9-620	8540
9-621+31			LIPL 9-620	8550
9-630	J124		LIPL 9-630	8560
	209-649		LIPL 9-630	8570
	119-407		LIPL 9-630	8580
	109-408		LIPL 9-630	8590
	J65		LIPL 9-630	8600
	119-407		LIPL 9-630	8610
	119-649		LIPL 9-630	8620
	J65		LIPL 9-630	8630
	119-407		LIPL 9-630	8640
	J61		LIPL 9-630	8650
	209-407		LIPL 9-630	8660
	109-645		LIPL 9-630	8670
	J124		LIPL 9-630	8680
	10.		LIPL 9-630	8690
	J185		LIPL 9-630	8700
	109-901		LIPL 9-630	8710
	J161		LIPL 9-630	8720
	9-540		LIPL 9-630	8730
	11W30		LIPL 9-630	8740
	J116		LIPL 9-630	8750
	709-631		LIPL 9-630	8760
	119-649	J182	LIPL 9-630	8770
9-631	109-645		LIPL 9-630	8780
	40W30		LIPL 9-630	8790
	20W30		LIPL 9-630	8800
	109-646		LIPL 9-630	8810
	J182		LIPL 9-630	8820
	509-801		LIPL 9-630	8830
	J161		LIPL 9-630	8840
	109-801		LIPL 9-630	8850
	11W30		LIPL 9-630	8860
	40HC		LIPL 9-630	8870
	J110		LIPL 9-630	8880
	30W30		LIPL 9-630	8890
	11W30		LIPL 9-630	8900
	40HC		LIPL 9-630	8910
	J111		LIPL 9-630	8920

	509-645		LIPL 9-630	8930
	J182		LIPL 9-630	8940
	109-647		LIPL 9-630	8950
	109-648		LIPL 9-630	8960
	J110		LIPL 9-630	8970
9-632	51W30		LIPL 9-630	8980
	109-901		LIPL 9-630	8990
	J114		LIPL 9-630	9000
	70	9-633	LIPL 9-630	9010
	109-910		LIPL 9-630	9020
	109-648		LIPL 9-630	9030
	40H0		LIPL 9-630	9040
	J113		LIPL 9-630	9050
	509-901		LIPL 9-630	9060
	11W30		LIPL 9-630	9070
	40H0		LIPL 9-630	9080
	J111	9-632	LIPL 9-630	9090
9-633	109-648		LIPL 9-630	9100
	109-646		LIPL 9-630	9110
	119-649	J110	LIPL 9-630	9120
9-645+01		0	LIPL 9-630	9130
9-646+01		0	LIPL 9-630	9140
9-647+110		0	LIPL 9-630	9150
9-648+110		0	LIPL 9-630	9160
9-649+ 0	0	0	LIPL 9-630	9170
9-650	109-801		LIPL 9-650	9180
	109-677		LIPL 9-650	9190
	J124		LIPL 9-650	9200
	105		LIPL 9-650	9210
	J185		LIPL 9-650	9220
	40H0		LIPL 9-650	9230
	J110		LIPL 9-650	9240
	709-653		LIPL 9-650	9250
	109-905		LIPL 9-650	9260
	J116		LIPL 9-650	9270
	70	9-654	LIPL 9-650	9280
	109-678		LIPL 9-650	9290
	J6		LIPL 9-650	9300
	J121		LIPL 9-650	9310
	109-677		LIPL 9-650	9320
	J122		LIPL 9-650	9330
	109-900		LIPL 9-650	9340
	J114		LIPL 9-650	9350
	709-651		LIPL 9-650	9360
	109-902		LIPL 9-650	9370
	J161	9-652	LIPL 9-650	9380
9-651	109-677		LIPL 9-650	9390
	20W30		LIPL 9-650	9400
	109-901		LIPL 9-650	9410
	J161		LIPL 9-650	9420
	J182		LIPL 9-650	9430
	109-901		LIPL 9-650	9440
	J161		LIPL 9-650	9450
9-652	119-407		LIPL 9-650	9460
	109-408		LIPL 9-650	9470
	J65		LIPL 9-650	9480
	40H0		LIPL 9-650	9490
	119-407		LIPL 9-650	9500
	J6		LIPL 9-650	9510
	J65		LIPL 9-650	9520

S/R--SET ALPHANUMERIC DATA

ASSUMES THERE IS A \$ AT 1W25.
IF THE NEXT \$ OCCURES IN THE
NEXT FIVE SPACES IT MAKES (0)
A BCD DATA TERM, PUTS IT ON
THE PRINT LIST, SETS H5 +, AND
LEAVES (0).
OTHERWISE IT MAKES (0) THE HEAD
OF A LIST OF LOCALLY NAMED
BCD DATA TERMS, PUTS THE LIST

AND DATA TERMS ON THE PRINT
LIST, SETS H5 -, AND LEAVES (0)
AND IT READS AND PRINTS CARDS
IF REQUIRED.

	119-407		LIPL 9-650	9530
	J61		LIPL 9-650	9540
	209-407	0	LIPL 9-650	9550
9-653	J8		LIPL 9-650	9560
9-654	109-901		LIPL 9-650	9570
	J161		LIPL 9-650	9580
	109-676		LIPL 9-650	9590
	J6		LIPL 9-650	9600
	J121		LIPL 9-650	9610
	609-679		LIPL 9-650	9620
	119-407		LIPL 9-650	9630
	109-409		LIPL 9-650	9640
	J65		LIPL 9-650	9650
	119-407		LIPL 9-650	9660
	119-679		LIPL 9-650	9670
	J65		LIPL 9-650	9680
	119-407		LIPL 9-650	9690
	J61		LIPL 9-650	9700
	209-407		LIPL 9-650	9710
9-655	9-675		LIPL 9-650	9720
	109-900		LIPL 9-650	9730
	J186		LIPL 9-650	9740
	709-656		LIPL 9-650	9750
	105		LIPL 9-650	9760
	J2		LIPL 9-650	9770
	70	9-669	LIPL 9-650	9780
	509-804		LIPL 9-650	9790
9-656	109-901		LIPL 9-650	9800
	J161		LIPL 9-650	9810
	J186		LIPL 9-650	9820
	709-657		LIPL 9-650	9830
	105		LIPL 9-650	9840
	J2		LIPL 9-650	9850
	70	9-663	LIPL 9-650	9860
	509-803		LIPL 9-650	9870
9-657	109-901		LIPL 9-650	9880
	J161		LIPL 9-650	9890
	J186		LIPL 9-650	9900
	709-658		LIPL 9-650	9910
	105		LIPL 9-650	9920
	J2		LIPL 9-650	9930
	70	9-664	LIPL 9-650	9940
	509-802		LIPL 9-650	9950
9-658	109-901		LIPL 9-650	9960
	J161		LIPL 9-650	9970
	J186		LIPL 9-650	9980
	709-659		LIPL 9-650	9990
	105		LIPL 9-650	0000
	J2		LIPL 9-650	0010
	70	9-665	LIPL 9-650	0020
	509-801		LIPL 9-650	0030
9-659	109-901		LIPL 9-650	0040
	J161		LIPL 9-650	0050
	J186		LIPL 9-650	0060
	709-661		LIPL 9-650	0070
	105		LIPL 9-650	0080
	J2		LIPL 9-650	0090
	70	9-667	LIPL 9-650	0100
	509-900		LIPL 9-650	0110

9-661	109-804		LIPL	9-650	0120
	J161		LIPL	9-650	0130
	109-905		LIPL	9-650	0140
	20W30		LIPL	9-650	0150
	9-520		LIPL	9-650	0160
	40HC		LIPL	9-650	0170
	119-679		LIPL	9-650	0180
	J197		LIPL	9-650	0190
	209-679		LIPL	9-650	0200
	109-678		LIPL	9-650	0210
	9-520		LIPL	9-650	0220
	J136		LIPL	9-650	0230
	J121		LIPL	9-650	0240
	J182		LIPL	9-650	0250
	219-679		LIPL	9-650	0260
	119-407		LIPL	9-650	0270
	119-679		LIPL	9-650	0280
	J65		LIPL	9-650	0290
	119-407		LIPL	9-650	0300
	109-408		LIPL	9-650	0310
	J65		LIPL	9-650	0320
	119-407		LIPL	9-650	0330
	129-679		LIPL	9-650	0340
	J65		LIPL	9-650	0350
	119-407		LIPL	9-650	0360
	J61		LIPL	9-650	0370
	209-407		LIPL	9-650	0380
	J161	9-655	LIPL	9-650	0390
9-663	509-901	9-660	LIPL	9-650	0400
9-664	509-902	9-660	LIPL	9-650	0410
9-665	509-903	9-660	LIPL	9-650	0420
9-667	509-904	9-660	LIPL	9-650	0430
9-668	60W30		LIPL	9-650	0440
	11W25		LIPL	9-650	0450
	40HC		LIPL	9-650	0460
	J111		LIPL	9-650	0470
	J8		LIPL	9-650	0480
	9-520		LIPL	9-650	0490
	40HC		LIPL	9-650	0500
	119-679		LIPL	9-650	0510
	J197		LIPL	9-650	0520
	209-679		LIPL	9-650	0530
	109-678		LIPL	9-650	0540
	9-520		LIPL	9-650	0550
	J136		LIPL	9-650	0560
	J121		LIPL	9-650	0570
	J182		LIPL	9-650	0580
	219-679		LIPL	9-650	0590
	119-407		LIPL	9-650	0600
	119-679		LIPL	9-650	0610
	J65		LIPL	9-650	0620
	119-407		LIPL	9-650	0630
	109-408		LIPL	9-650	0640
	J65		LIPL	9-650	0650
	119-407		LIPL	9-650	0660
	129-679		LIPL	9-650	0670
	J65		LIPL	9-650	0680
9-669	109-901		LIPL	9-650	0690
	J161		LIPL	9-650	0700
	119-407		LIPL	9-650	0710

S/R--READ AND PRINT CARDS

CLEARs PRINT LINE AND READs A CARD. IF THERE IS NO CARD PRESENT IT PRINTs 'ERROR--NO CARD' AND IT THEN DOES A J7. IF THERE IS A CARD IT PUTs INTO THE PRINT LINE AT COLUMN 110 THE WORD 'CARD' FOLLOWED BY AN INTEGER CARD COUNT. IT THEN PRINTs THE PRINT LINE. IT ADDs THE SYMBOL 'NEW CARD' TO THE PRINT LIST FOLLOWED BY THE CARD NUMBER WHERE THE CARD NUMBER IS A LOCAL DATA TERM. 1W25 IS SET TO ONE.

109-410		LIPL 9-650	0720
J65		LIPL 9-650	0730
119-407		LIPL 9-650	0740
J61		LIPL 9-650	0750
209-407		LIPL 9-650	0760
1J C		LIPL 9-650	0770
119-679		LIPL 9-650	0780
J197	J3	LIPL 9-650	0790
9-675 11W25		LIPL 9-650	0800
109-981		LIPL 9-650	0810
J115		LIPL 9-650	0820
709-680	0	LIPL 9-650	0830
9-676+ C	0	LIPL 9-650	0840
9-677+01	0	LIPL 9-650	0850
9-678+21		LIPL 9-650	0860
9-679+ C	0	LIPL 9-650	0870
9-680 J154		LIPL 9-600	0880
J180		LIPL 9-680	0890
709-681		LIPL 9-680	0900
109-688		LIPL 9-680	0910
J160		LIPL 9-680	0920
109-689		LIPL 9-680	0930
J157		LIPL 9-680	0940
109-687		LIPL 9-680	0950
J160		LIPL 9-680	0960
109-413		LIPL 9-680	0970
J125		LIPL 9-680	0980
J157		LIPL 9-680	0990
J155		LIPL 9-680	1000
119-407		LIPL 9-680	1010
109-412		LIPL 9-680	1020
J65		LIPL 9-680	1030
119-407		LIPL 9-680	1040
109-413		LIPL 9-680	1050
J120		LIPL 9-680	1060
J65		LIPL 9-680	1070
119-407		LIPL 9-680	1080
J61		LIPL 9-680	1090
209-407		LIPL 9-680	1100
109-688		LIPL 9-680	1110
11W25		LIPL 9-680	1120
J121		LIPL 9-680	1130
509-690		LIPL 9-680	1140
J157		LIPL 9-680	1150
109-690		LIPL 9-680	1160
J157		LIPL 9-680	1170
11W21		LIPL 9-680	1180
11W25		LIPL 9-680	1190
J121	J8	LIPL 9-680	1200
9-681 J154		LIPL 9-680	1210
J155		LIPL 9-680	1220
109-220		LIPL 9-680	1230
10J157		LIPL 9-680	1240
J100		LIPL 9-680	1250
J155	J7	LIPL 9-680	1260
9-687+01	115	LIPL 9-680	1270
9-688+01	109	LIPL 9-680	1280
9-689+21 CARD		LIPL 9-680	1290
9-690+21		LIPL 9-680	1300

S/R--PRINT AND ERASE PRINT LIST

THE PAGE IS DIVIDED INTO FOUR VERTICAL STRIPS, EACH 28 COLUMNS WIDE. A LIST IS PRINTED DOWN A STRIP. THE HIGHEST LEVEL LISTS ARE PRINTED DOWN THE LEFT STRIP. THERE SUBLISTS ARE INTERPOLATED AND PRINTED IN THE STRIP TO THE RIGHT OF THE SUPER-LIST. ALL LISTS OF DEPTH THREE OR GREATER ARE PRINTED IN THE THIRD STRIP FROM THE LEFT. LISTS AT THE HIGHEST LEVEL AND LISTS OF DEPTH THREE OR GREATER ARE SEPERATED BY PRINTING ONE BLANK LINE BEFORE AND AFTER. DATA TERMS AT THE HIGHEST LEVEL ARE PRINTED IN THE LEFT STRIP. IF A DATA TERM IS NAMED IN A SUBLIST IT IS PRINTED ON THE SAME LINE AS THE CELL THAT NAMES IT AND IN THE NEXT STRIP TO THE LEFT OF THE CELL THAT NAMES IT. THE NAME GOES IN COLUMN 1, P IN COLUMN 6, Q IN 10, SYMB IN 12, AND LINK IN 18-22, MOD 28. CARD NUMBERS ARE PRINTED AS 'CARD N° BEGINNING AT COLUMN 111. THEY ARE PRINTED ON THE SAME LINE AS THE FIRST THING ASSEMBLED BY THAT CARD. IF A CARD CAUSES NOTHING TO BE ASSEMBLED (AS FOR EXAMPLE A CARD WITH NOTHING BUT COMMENTS) THAT CARD NUMBER IS NOT PRINTED AT ALL. THE HIGHEST LEVEL CELLS ON THE PRINT LIST THAT ARE NOT DATA TERMS ARE NOT PART OF ANY LIST AND HENCE ARE ERASED. THE CARD NUMBERS IN THE PRINT LIST ARE ALSO ERASED. WHEN DONE, THE PRINT LIST IS ERASED AND THE NAME OF THE PRINT LIST IS PUT IN THE 'LAST CELL OF PRINT LIST ' WORKING CELL. NO EXTERNAL SUBROUTINES ARE USED. . EXCEPT 9-780 IF NO LISTING IS REQUIRED.

9-700	J154		LIPL	9-700	1310
	019-417		LIPL	9-700	1320
	709-780		LIPL	9-700	1330
	109-406		LIPL	9-700	1340
9-701	J60		LIPL	9-700	1350
	70	9-702	LIPL	9-700	1360
	509-406		LIPL	9-700	1370
	609-407		LIPL	9-700	1380
	J75	J71	LIPL	9-700	1390
9-702	12HC		LIPL	9-700	1400
	109-705		LIPL	9-700	1410
	J6		LIPL	9-700	1420
	J10		LIPL	9-700	1430
	709-703		LIPL	9-700	1440
	J1	9-701	LIPL	9-700	1450
9-703	12HC		LIPL	9-700	1460
	J9	9-701	LIPL	9-700	1470
9-705+	9-706	0	LIPL	9-700	1480
9-706+	0		LIPL	9-700	1490
	+ 9-408		LIPL	9-700	1500
	+ 9-711		LIPL	9-700	1510
	+ 9-409		LIPL	9-700	1520
	+ 9-729		LIPL	9-700	1530
	+ 9-412		LIPL	9-700	1540
	+ 9-707	0	LIPL	9-700	1550
9-707	109-746		LIPL	9-700	1560
	J160		LIPL	9-700	1570
	109-747		LIPL	9-700	1580
	J157		LIPL	9-700	1590
	109-901		LIPL	9-700	1600
	J161		LIPL	9-700	1610
	J60		LIPL	9-700	1620
	12HC		LIPL	9-700	1630
	J157		LIPL	9-700	1640
	12HC	J9	LIPL	9-700	1650
9-711	J60		LIPL	9-700	1660
	109-901		LIPL	9-700	1670
	J160		LIPL	9-700	1680
	12HC		LIPL	9-700	1690
	J156		LIPL	9-700	1700
	109-908		LIPL	9-700	1710
	J160		LIPL	9-700	1720
	12HC		LIPL	9-700	1730
	109-901		LIPL	9-700	1740
	J127		LIPL	9-700	1750
	70	9-712	LIPL	9-700	1760
	12HC		LIPL	9-700	1770
	109-741		LIPL	9-700	1780
	J127		LIPL	9-700	1790
	70	9-713	LIPL	9-700	1800
	12HC		LIPL	9-700	1810
	109-742		LIPL	9-700	1820
	J127		LIPL	9-700	1830
	70	9-714	LIPL	9-700	1840
	109-745	9-715	LIPL	9-700	1850
9-712	109-742	9-715	LIPL	9-700	1860
9-713	109-743	9-715	LIPL	9-700	1870
9-714	109-744	9-715	LIPL	9-700	1880
9-715	J157		LIPL	9-700	1890
	109-922		LIPL	9-700	1900

	J160		LIPL 9-700	1910
	12HC		LIPL 9-700	1920
	J159		LIPL 9-700	1930
	J155	J154	LIPL 9-700	1940
*****	9-716 J60		LIPL 9-700	1950
* PRINT LIST FORMAT *	12HC		LIPL 9-700	1960
-----	109-717		LIPL 9-700	1970
* AS EACH CELL IS ASSEMBLED *	J6		LIPL 9-700	1980
* ITS NAME IS PUT ON THE PRINT *	J10		LIPL 9-700	1990
* LIST 9-406. *	70	J1	LIPL 9-700	2000
* WHEN A DATA TERM IS ASSEM-	109-901		LIPL 9-700	2010
* BLED, THE SYMBOL 9-408 IS PUT *	J160		LIPL 9-700	2020
* ON THE PRINT LIST JUST BEFORE *	12HC		LIPL 9-700	2030
* THE NAME OF THE DATA TERM. *	J156		LIPL 9-700	2040
* THIS IS NECESSARY SINCE THE *	109-908		LIPL 9-700	2050
* LISTING ROUTINE 9-700 MUST *	J160		LIPL 9-700	2060
* INTERPRETE A DATA TERM IN A *	12HC		LIPL 9-700	2070
* DIFFERENT MANNER THAN A LIST *	J190		LIPL 9-700	2080
* CELL. *	J156		LIPL 9-700	2090
* WHEN A NEW LIST IS BEGUN. *	109-910		LIPL 9-700	2100
* THE EXECUTIVE ROUTINE PUTS *	J160		LIPL 9-700	2110
* THE SYMBOL 9-409 ON THE PRINT *	12HC		LIPL 9-700	2120
* LIST JUST BEFORE THE FIRST *	J191		LIPL 9-700	2130
* CELL OF THE LIST. WHEN A LIST *	J156		LIPL 9-700	2140
* IS TERMINATED, THE EXECUTIVE *	109-912		LIPL 9-700	2150
* ROUTINE PUTS THE SYMBOL 9-410 *	J160		LIPL 9-700	2160
* JUST AFTER THE LAST CELL OF *	12HC		LIPL 9-700	2170
* THE LIST. *	J192		LIPL 9-700	2180
* WHEN A CARD IS READ BY *	J156		LIPL 9-700	2190
* ROUTINE 9-660 (READ AND PRINT *	109-918		LIPL 9-700	2200
* A CARD), THIS ROUTINE PUTS THE *	J160		LIPL 9-700	2210
* SYMBOL 9-412 ON THE END OF THE *	12HC		LIPL 9-700	2220
* PRINT LIST FOLLOWED BY A *	J193		LIPL 9-700	2230
* LOCALLY NAMED COPY OF THE *	J156		LIPL 9-700	2240
* INTEGER DATA TERM CARD COUNT. *	40HC		LIPL 9-700	2250
* 9-413. THE LISTING ROUTINE *	J81		LIPL 9-700	2260
* 9-700 MUST OF COURSE ERASE *	109-408		LIPL 9-700	2270
* THIS DATA TERM. *	J2		LIPL 9-700	2280
* THE EXECUTIVE ROUTINE *	70	9-720	LIPL 9-700	2290
* OPERATES AS IF THE ENTIRE READ *	J155		LIPL 9-700	2300
* GROUP WAS A LIST TERMINATED BY *	J154	9-716	LIPL 9-700	2310
* A 'ND' OR 'GT' INSTEAD OF A *	9-717+ 9-718	0	LIPL 9-700	2320
* ')). AS A RESULT UNPARENTH-	9-718+ C		LIPL 9-700	2330
* IZED SYMBOLS (FOR EXAMPLE UN-	+ 9-408		LIPL 9-700	2340
* PARENTHIZED LIST NAMES, DATA *	+ 9-721		LIPL 9-700	2350
* TERM NAMES, AND NEUMONIC ASSI-	+ 9-409		LIPL 9-700	2360
* GNMENTS) ARE ASSEMBLED INTO *	9-719+ 9-727		LIPL 9-700	2370
* A LIST. THEREFORE THE LISTING *	+ 9-410		LIPL 9-700	2380
* PROGRAM 9-700 (AND THE NO-LIST *	+ JC		LIPL 9-700	2390
* SUBROUTINE 9-780) HAS THE *	+ 9-412		LIPL 9-700	2400
* RESPONSIBILITY OF RETURNING *	+ 9-726	0	LIPL 9-700	2410
* THE CELLS OF THIS LIST TO *	9-720 J60		LIPL 9-700	2420
* AVAILABLE SPACE. THESE CELLS *	9-721 J60		LIPL 9-700	2430
* ARE IDENTIFIED BY THE FACT *	109-929		LIPL 9-700	2440
* THAT THEY OCCURE ON THE PRINT *	J160		LIPL 9-700	2450
* LIST WHERE THE LEVEL COUNT IS *	12HC		LIPL 9-700	2460
* ZERO. THE LEVEL COUNT IS *	J156		LIPL 9-700	2470
* INITIALLY ZERO, THE SYMBOL *	109-936		LIPL 9-700	2480
* 9-409 (BEGINNING OF SUBLIST) *	J160		LIPL 9-700	2490

* ADDS ONE TO THE LEVEL COUNT *
 * AND THE SYMBOL 9-410 (END OF *
 * SUBLIST) SUBTRACTS ONE FROM *
 * THE LEVEL COUNT. *

	12H0		LIPL	9-700	2500
	109-901		LIPL	9-700	2510
	J127		LIPL	9-700	2520
	70	9-722	LIPL	9-700	2530
	12H0		LIPL	9-700	2540
	109-741		LIPL	9-700	2550
	J127		LIPL	9-700	2560
	70	9-723	LIPL	9-700	2570
	12H0		LIPL	9-700	2580
	109-742		LIPL	9-700	2590
	J127		LIPL	9-700	2600
	70	9-724	LIPL	9-700	2610
	109-745	9-725	LIPL	9-700	2620
9-722	109-742	9-725	LIPL	9-700	2630
9-723	109-743	9-725	LIPL	9-700	2640
9-724	109-744	9-725	LIPL	9-700	2650
9-725	J157		LIPL	9-700	2660
	109-950		LIPL	9-700	2670
	J160		LIPL	9-700	2680
	12H0		LIPL	9-700	2690
	J159		LIPL	9-700	2700
	J155		LIPL	9-700	2710
	J154	9-716	LIPL	9-700	2720
9-726	109-748		LIPL	9-700	2730
	11X25		LIPL	9-700	2740
	J121		LIPL	9-700	2750
	509-747		LIPL	9-700	2760
	J157		LIPL	9-700	2770
	109-901		LIPL	9-700	2780
	J161		LIPL	9-700	2790
	J60		LIPL	9-700	2800
	12H0		LIPL	9-700	2810
	J157		LIPL	9-700	2820
	12H0		LIPL	9-700	2830
	J9	9-716	LIPL	9-700	2840
9-727	40X21		LIPL	9-700	2850
	109-929		LIPL	9-700	2860
	20X21		LIPL	9-700	2870
	109-728		LIPL	9-700	2880
	209-719		LIPL	9-700	2890
	9-716		LIPL	9-700	2900
	30X21		LIPL	9-700	2910
	109-727		LIPL	9-700	2920
	209-719	9-716	LIPL	9-700	2930
9-728	40X21		LIPL	9-700	2940
	109-957		LIPL	9-700	2950
	20X21		LIPL	9-700	2960
	109-731		LIPL	9-700	2970
	209-719		LIPL	9-700	2980
	9-716		LIPL	9-700	2990
	30X21		LIPL	9-700	3000
	109-728		LIPL	9-700	3010
	209-719	9-716	LIPL	9-700	3020
9-729	J155		LIPL	9-700	3030
	J154		LIPL	9-700	3040
	9-716		LIPL	9-700	3050
	J155	J154	LIPL	9-700	3060
9-731	J155		LIPL	9-700	3070
	J154		LIPL	9-700	3080
	9-716		LIPL	9-700	3090

S/R--SKIP COMS OR SET COPY

IF 1W25 + 1 IS A ' SET COPY
FLAG AND FIND THE NEXT CHARACT
ER AFTER 1W25 + 1.
OTHERWISE SKIP OVER THE
COMMENTS, READING CARDS IF
NECESSARY, AND STOP AT THE
FIRST NON-BLANK CHARACTER AFTER
THE NEXT .

J155		LIPL	9-700	3100
J154	9-716	LIPL	9-700	3110
9-741+11		LIPL	9-700	3120
9-742+210 1		LIPL	9-700	3130
9-743+211 1		LIPL	9-700	3140
9-744+212 1		LIPL	9-700	3150
9-745+213 1		LIPL	9-700	3160
9-746+01	110	LIPL	9-700	3170
9-747+21CARD		LIPL	9-700	3180
9-748+01	111	LIPL	9-700	3190
9-750	9-510	LIPL	9-750	3200
709-751		LIPL	9-750	3210
11W9		LIPL	9-750	3220
10'		LIPL	9-750	3230
J2		LIPL	9-750	3240
709-752		LIPL	9-750	3250
10J4		LIPL	9-750	3260
209-404	9-510	LIPL	9-750	3270
9-751	11W9	LIPL	9-750	3280
10'		LIPL	9-750	3290
J2		LIPL	9-750	3300
70	9-510	LIPL	9-750	3310
9-752	11W25	LIPL	9-750	3320
10'		LIPL	9-750	3330
J185		LIPL	9-750	3340
J8		LIPL	9-750	3350
70	9-510	LIPL	9-750	3360
9-680		LIPL	9-750	3370
J186		LIPL	9-750	3380
709-752		LIPL	9-750	3390
10'		LIPL	9-750	3400
J2		LIPL	9-750	3410
709-752	9-510	LIPL	9-750	3420
9-760	01W1	LIPL	9-760	3430
70	9-761	LIPL	9-760	3440
9-520		LIPL	9-760	3450
40HC		LIPL	9-760	3460
11W0		LIPL	9-760	3470
J197		LIPL	9-760	3480
20W0	9-762	LIPL	9-760	3490
9-761	10J3	LIPL	9-760	3500
20W1		LIPL	9-760	3510
9-762	119-407	LIPL	9-760	3520
11W0		LIPL	9-760	3530
J65		LIPL	9-760	3540
119-407		LIPL	9-760	3550
J60		LIPL	9-760	3560
209-407		LIPL	9-760	3570
21W0		LIPL	9-760	3580
11W3		LIPL	9-760	3590
10 9		LIPL	9-760	3600
J2		LIPL	9-760	3610
70	9-763	LIPL	9-760	3620
11W3		LIPL	9-760	3630
11W0		LIPL	9-760	3640
J195		LIPL	9-760	3650
10 9		LIPL	9-760	3660
20W3		LIPL	9-760	3670
11W2		LIPL	9-760	3680

S/R--ADD (0) TO LIST

IF THE CURRENT CELL IS NON-
EMPTY A NEW CURRENT CELL IS
CREATED AND THE NAME OF THIS
NEW CELL IS MADE THE LINK OF
THE OLD CELL.
IF THE CURRENT CELL IS EMPTY
THE EMPTY FLAG IS REVERSED.
IN ANY CASE THE CURRENT CELL IS
PUT ON THE PRINT LIST AND IF P
AND/OR Q IS NOT NINE THEY ARE
RESET TO NINE AFTER THE CURRENT
CELL'S P AND Q ARE SET. IF P
AND Q WERE NINE TO BEGIN WITH

THEN (0) IS STORED WITH ITS
ORIGINAL SYMBOL TYPE, UNLESS
DATA MODE FLAG IS -. IN
WHICH CASE Q IS SET ZERO.

	10 9		LIPL 9-760	3690
	J2		LIPL 9-760	3700
	70	0	LIPL 9-760	3710
	11W2		LIPL 9-760	3720
	11WC		LIPL 9-760	3730
	J194		LIPL 9-760	3740
	10 9		LIPL 9-760	3750
	20W2	0	LIPL 9-760	3760
9-763	019-411		LIPL 9-760	3770
	70	0	LIPL 9-760	3780
	10 0		LIPL 9-760	3790
	11WC	J195	LIPL 9-760	3800
S/R--ADD AN EMPTY CELL TO LIST IF CURRENT CELL IS EMPTY DO NOTHING. OTHERWISE A NEW CELL IS CREATED AND THE NAME OF THIS CELL IS MADE THE LINK OF THE OLD CELL	9-770 01W1		LIPL 9-770	3810
	70	0	LIPL 9-770	3820
	9-520		LIPL 9-770	3830
	40H0		LIPL 9-770	3840
	11WC		LIPL 9-770	3850
	J197		LIPL 9-770	3860
	10J4		LIPL 9-770	3870
	20W1		LIPL 9-770	3880
	20WC	0	LIPL 9-770	3890
AND THE EMPTY FLAG IS REVERSED. S/R--ERASE PRINT LIST	9-780 109-406		LIPL 9-780	3900
	10J9		LIPL 9-780	3910
	J50		LIPL 9-780	3920
	10J4		LIPL 9-780	3930
	209-417		LIPL 9-780	3940
9-781	J60		LIPL 9-780	3950
	70	9-782	LIPL 9-780	3960
	509-406		LIPL 9-780	3970
	609-407		LIPL 9-780	3980
	J75		LIPL 9-780	3990
	J71	J30	LIPL 9-780	4000
9-782	12H0		LIPL 9-780	4010
	109-785		LIPL 9-780	4020
	J6		LIPL 9-780	4030
	J10		LIPL 9-780	4040
	709-783		LIPL 9-780	4050
	J1	9-781	LIPL 9-780	4060
9-783	12H0		LIPL 9-780	4070
	01WC	9-781	LIPL 9-780	4080
9-785+	9-786	C	LIPL 9-780	4090
9-786+	C		LIPL 9-780	4100
	+ 9-408		LIPL 9-780	4110
	+ J60		LIPL 9-780	4120
	+ 9-409		LIPL 9-780	4130
	+ 9-788		LIPL 9-780	4140
	+ 9-410		LIPL 9-780	4150
	+ J30		LIPL 9-780	4160
	+ 9-412		LIPL 9-780	4170
	+ 9-787	0	LIPL 9-780	4180
9-787	J60		LIPL 9-780	4190
	12H0	J9	LIPL 9-780	4200
9-788	10J8	J50	LIPL 9-780	4210
S/R--PRINT NEUMONIC, INTERNAL TABLE	9-790 J154		LIPL 9-790	4220
	019-418		LIPL 9-790	4230
	709-791		LIPL 9-790	4240
	109-795		LIPL 9-790	4250
	209-418		LIPL 9-790	4260
	109-200		LIPL 9-790	4270
	10J157		LIPL 9-790	4280

	J100		LIPL 9-790	4290
9-791	019-419		LIPL 9-790	4300
	709-792		LIPL 9-790	4310
	109-797		LIPL 9-790	4320
	209-419		LIPL 9-790	4330
	109-960		LIPL 9-790	4340
	J160		LIPL 9-790	4350
	109-210		LIPL 9-790	4360
	10J157		LIPL 9-790	4370
	J100	9-793	LIPL 9-790	4380
9-792	10JC		LIPL 9-790	4390
	209-419		LIPL 9-790	4400
9-793	119-403		LIPL 9-790	4410
	109-400		LIPL 9-790	4420
	J51		LIPL 9-790	4430
	J150		LIPL 9-790	4440
	J154		LIPL 9-790	4450
9-794	019-418		LIPL 9-790	4460
	019-419		LIPL 9-790	4470
	70J31		LIPL 9-790	4480
	J155		LIPL 9-790	4490
	J154	9-794	LIPL 9-790	4500
9-795	11W0		LIPL 9-790	4510
	J81		LIPL 9-790	4520
	709-796		LIPL 9-790	4530
	J157		LIPL 9-790	4540
	109-908		LIPL 9-790	4550
	J160		LIPL 9-790	4560
	11W0		LIPL 9-790	4570
	J82		LIPL 9-790	4580
	J156		LIPL 9-790	4590
	11W0		LIPL 9-790	4600
	J60		LIPL 9-790	4610
	J60		LIPL 9-790	4620
	20W0	0	LIPL 9-790	4630
9-796	10J3		LIPL 9-790	4640
	209-418	0	LIPL 9-790	4650
9-797	109-960		LIPL 9-790	4660
	J160		LIPL 9-790	4670
	11W1		LIPL 9-790	4680
	J81		LIPL 9-790	4690
	709-798		LIPL 9-790	4700
	109-799		LIPL 9-790	4710
	J157		LIPL 9-790	4720
	J156		LIPL 9-790	4730
	109-968		LIPL 9-790	4740
	J160		LIPL 9-790	4750
	11W1		LIPL 9-790	4760
	J82		LIPL 9-790	4770
	J156		LIPL 9-790	4780
	11W1		LIPL 9-790	4790
	J60		LIPL 9-790	4800
	J60		LIPL 9-790	4810
	20W1	0	LIPL 9-790	4820
9-798	10JC		LIPL 9-790	4830
	209-419	J4	LIPL 9-790	4840
9-799+218-			LIPL 9-790	4850
9801 -01		01	LIPL CONSTANTS	4860
9802 -01		02	LIPL CONSTANTS	4870

9803 -01	03 LIPL CONSTANTS4880
9804 -01	04 LIPL CONSTANTS4890
9900 +01	00 LIPL CONSTANTS4900
9901 +01	01 LIPL CONSTANTS4910
9902 +01	02 LIPL CONSTANTS4920
9903 +01	03 LIPL CONSTANTS4930
9904 +01	04 LIPL CONSTANTS4940
9905 +01	05 LIPL CONSTANTS4950
9908 +01	08 LIPL CONSTANTS4960
9910 +01	10 LIPL CONSTANTS4970
9912 +01	12 LIPL CONSTANTS4980
9918 +01	18 LIPL CONSTANTS4990
9922 +01	22 LIPL CONSTANTS5000
9929 +01	29 LIPL CONSTANTS5010
9936 +01	36 LIPL CONSTANTS5020
9950 +01	50 LIPL CONSTANTS5030
9957 +01	57 LIPL CONSTANTS5040
9960 +01	60 LIPL CONSTANTS5050
9968 +01	68 LIPL CONSTANTS5060
9981 +01	81 LIPL CONSTANTS5070